Task 3

August 17, 2023

1 Task 3 - Cricket Player Performance Predictionusing machine learning

2 Problem Statement

The data is scraped from ESPN Cricinfo, matches till 18th May 2019 are only counted. We need to analyze the performance of all the players playing in CWC 2019.

2.1 Import Data and Required Packages

[1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
```

[2]:
```
batter_df = pd.read_csv("Batsman_Data.csv")
bowler_df = pd.read_csv("Bowler_data.csv")
grnd_avg_df = pd.read_csv("Ground_Averages.csv")
odi_res_df = pd.read_csv("ODI_Match_Results.csv")
odi_tot_df = pd.read_csv("ODI_Match_Totals.csv")
wc_players_df = pd.read_csv("WC_players.csv")
```

[3]:
```
batter_df.sample(5)
```

[3]:
```
      Unnamed: 0 Bat1 Runs  BF      SR  4s 6s     Opposition         Ground  \
6831        6832   38   38  48   79.16   4  0    v Zimbabwe       Auckland
2555        2556   31   31  49   63.26   3  0     v England   Johannesburg
7999        8000   59   59  65   90.76   6  1     v Ireland         Dublin
1937        1938    7    7  10   70.00   1  0   v Australia  Colombo (RPS)
7292        7293  104  104  78  133.33  13  2  v New Zealand    Birmingham

       Start Date   Match_ID            Batsman  Player_ID
6831  14 Mar 2015  ODI # 3636        Virat Kohli     253802
2555  12 Feb 2016  ODI # 3737          JP Duminy      44932
```

```
7999   25 Aug 2011  ODI # 3185          Eoin Morgan       24598
1937   24 Aug 2016  ODI # 3769  Dhananjaya de Silva      465793
7292    9 Jun 2015  ODI # 3654              Joe Root     303669
```

[4]:
```python
bowler_df.sample(5)
```

[4]:
```
      Unnamed: 0 Overs Mdns Runs Wkts  Econ    Ave    SR      Opposition  \
8069        8070     -    -    -    -     -      -     -  v South Africa
5463        5464  10.0    0   35    1  3.50  35.00  60.0     v Australia
324          325     -    -    -    -     -      -     -   v Afghanistan
1477        1478     -    -    -    -     -      -     -      v Pakistan
2850        2851     -    -    -    -     -      -     -   v West Indies

           Ground   Start Date    Match_ID           Bowler  Player_ID
8069  Johannesburg  12 Feb 2016  ODI # 3737      Eoin Morgan      24598
5463          Pune  13 Oct 2013  ODI # 3419  Ravindra Jadeja     234675
324     Gros Islet  11 Jun 2017  ODI # 3887        Shai Hope     581379
1477     Abu Dhabi  25 Dec 2013  ODI # 3448     Kusal Perera     300631
2850        Durban  16 Jan 2015  ODI # 3579       Hashim Amla      43906
```

[5]:
```python
grnd_avg_df.sample(5)
```

[5]:
```
                                                Ground       Span  Mat  Won  \
1                      Feroz Shah Kotla, Delhi - India  2013-2019    4    4
91  Greater Noida Sports Complex Ground, Greater N…  2017-2017    5    5
41                  Mannofield Park, Aberdeen - Scotland  2013-2014    3    3
98                      Old Hararians, Harare - Zimbabwe  2018-2018    5    5
6   Brisbane Cricket Ground, Woolloongabba, Brisba…  2013-2018    8    8

    Tied  NR  Runs  Wkts  Balls    Ave   RPO
1      0   0  1789    75   2331  23.85  4.60
91     0   0  2629    79   2918  33.27  5.40
41     0   0  1094    45   1316  24.31  4.98
98     0   0  2156    75   2522  28.74  5.12
6      0   0  3671   123   4189  29.84  5.25
```

[6]:
```python
odi_res_df.sample(5)
```

[6]:
```
      Unnamed: 0 Result     Margin    BR Toss  Bat      Opposition  \
409         1024    won    21 runs   NaN  won  1st     v Zimbabwe
421          464    won  3 wickets   3.0  won  2nd  v New Zealand
692          634   lost  4 wickets  21.0  won  1st    v Australia
646          205    won    19 runs   NaN  won  2nd  v West Indies
1128        1073    won    48 runs   NaN  won  1st  v West Indies

          Ground   Start Date    Match_ID     Country  Country_ID
409        Dhaka  28 Nov 2014  ODI # 3555  Bangladesh          25
```

```
421   Dubai (DSC)   8 Dec 2014  ODI # 3564    Pakistan          7
692    Wellington   6 Feb 2016  ODI # 3733   Newzealad          5
646     Pallekele   7 Nov 2015  ODI # 3704    SriLanka          8
1128   Providence  22 Jul 2018  ODI # 4022  Bangladesh         25
```

[7]:
```python
odi_tot_df.sample(5)
```

[7]:
```
      Unnamed: 0  Score  Overs   RPO  Target  Inns Result      Opposition  \
175         1098  350/6   50.0  7.00     NaN     1   lost         v India
785          772    241   48.4  4.95   261.0     2   lost   v New Zealand
1090        1189  310/8   50.0  6.20     NaN     1   lost       v England
359          731  263/7   50.0  5.26     NaN     1    won   v West Indies
1290        1075  213/5   22.5  9.32   210.0     2    won   v West Indies

                Ground   Start Date    Match_ID     Country  Country_ID
175             Nagpur  30 Oct 2013  ODI # 3424   Australia           2
785             Ranchi  26 Oct 2016  ODI # 3799       India           6
1090  Chester-le-Street  21 Jun 2018  ODI # 4012   Australia           2
359              Delhi  11 Oct 2014  ODI # 3533       India           6
1290  Dublin (Malahide)  17 May 2019  ODI # 4137  Bangladesh          25
```

[8]:
```python
wc_players_df.sample(5)
```

[8]:
```
                  Player      ID     Country
133  Milinda Siriwardana  222354    SriLanka
67          Kedar Jadhav  290716       India
73         Hardik Pandya  625371       India
89             Ish Sodhi  559066  NewZealand
52            Alex Hales  249866     England
```

[9]:
```python
common = set.intersection(set(odi_res_df['Start Date']), set(odi_tot_df['Start␣
↪Date']))
```

[10]:
```python
df = pd.concat([
    odi_res_df[odi_res_df['Start Date']. isin(common)],
    odi_tot_df[odi_tot_df['Start Date']. isin(common)]]).sort_values(by='Start␣
↪Date')
```

[11]:
```python
c = set.intersection(set(odi_res_df['Start Date']), set(odi_tot_df['Start␣
↪Date']),set(batter_df['Start Date']), set(bowler_df['Start Date']))


bat_boll_res_tot = pd.concat([
    odi_res_df[odi_res_df['Start Date']. isin(c)],
    odi_tot_df[odi_tot_df['Start Date']. isin(c)],
    batter_df[batter_df['Start Date'].isin(c)],
    bowler_df[bowler_df['Start Date'].isin(c)]]).sort_values(by='Start Date')
```

[12]:
```
bat_boll_res_tot.sample(5)
```

[12]:
```
      Unnamed: 0 Result   Margin  BR  Toss  Bat     Opposition  \
669          621    won      NaN NaN   NaN  NaN     v Pakistan
5728        5729    NaN      NaN NaN   NaN  NaN  v New Zealand
1291         552   lost  80 runs NaN  lost  2nd    v Australia
8606        8607    NaN      NaN NaN   NaN  NaN  v West Indies
432          899   lost  87 runs NaN  lost  2nd    v Sri Lanka

               Ground   Start Date    Match_ID  …    SR   4s   6s Batsman  \
669          Auckland  31 Jan 2016  ODI # 3730  …   NaN  NaN  NaN     NaN
5728  Mount Maunganui  28 Jan 2019  ODI # 4088  …  30.0  NaN  NaN     NaN
1291        Abu Dhabi  27 Mar 2019  ODI # 4118  …   NaN  NaN  NaN     NaN
8606           Sylhet  14 Dec 2018  ODI # 4073  …     -  NaN  NaN     NaN
432     Colombo (RPS)  16 Dec 2014  ODI # 3569  …   NaN  NaN  NaN     NaN

     Player_ID  Mdns  Wkts  Econ    Ave             Bowler
669        NaN   NaN   NaN   NaN    NaN                NaN
5728  326016.0     1     2  4.60  23.00  Bhuvneshwar Kumar
1291       NaN   NaN   NaN   NaN    NaN                NaN
8606   56025.0     0     0  4.66      -        Mahmudullah
432        NaN   NaN   NaN   NaN    NaN                NaN

[5 rows x 30 columns]
```

[13]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 2597 entries, 891 to 790
Data columns (total 17 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   Unnamed: 0   2597 non-null   int64
 1   Result       2597 non-null   object
 2   Margin       1301 non-null   object
 3   BR           606 non-null    float64
 4   Toss         1301 non-null   object
 5   Bat          1301 non-null   object
 6   Opposition   2597 non-null   object
 7   Ground       2597 non-null   object
 8   Start Date   2597 non-null   object
 9   Match_ID     2597 non-null   object
 10  Country      2597 non-null   object
 11  Country_ID   2597 non-null   int64
 12  Score        1296 non-null   object
 13  Overs        1296 non-null   float64
 14  RPO          1296 non-null   object
 15  Target       620 non-null    float64
```

```
 16  Inns          1296 non-null   float64
dtypes: float64(4), int64(2), object(11)
memory usage: 365.2+ KB
```

2.2 Converting 'Start Date' into date/time data type

[14]:
```python
df['Start Date'] = pd.to_datetime(df['Start Date'])
```

[15]:
```python
df['Start Date'].info()
```

```
<class 'pandas.core.series.Series'>
Int64Index: 2597 entries, 891 to 790
Series name: Start Date
Non-Null Count  Dtype
--------------  -----
2597 non-null   datetime64[ns]
dtypes: datetime64[ns](1)
memory usage: 40.6 KB
```

[16]:
```python
df.sample(5)
```

[16]:
```
      Unnamed: 0 Result   Margin  BR Toss  Bat      Opposition         Ground  \
339          453   lost      NaN NaN  NaN  NaN     v Sri Lanka       Dambulla
1151         965    n/r      NaN NaN  NaN  NaN     v Sri Lanka       Dambulla
7            836    won      NaN NaN  NaN  NaN         v India         Rajkot
606          622   lost  20 runs NaN  won  2nd  v South Africa      Centurion
318          312    won  75 runs NaN  won  1st     v Sri Lanka  Colombo (RPS)

     Start Date    Match_ID      Country  Country_ID  Score  Overs   RPO  \
339  2014-08-30  ODI # 3519     Pakistan           7    102   32.1  3.17
1151 2018-10-10  ODI # 4052      England           1   92/2   15.0  6.13
7    2013-01-11  ODI # 3318      England           1  325/4   50.0  6.50
606  2015-08-19  ODI # 3676    Newzealad           5    NaN    NaN   NaN
318  2014-07-06  ODI # 3500  SouthAfrica           3    NaN    NaN   NaN

      Target  Inns
339      NaN   1.0
1151     NaN   1.0
7        NaN   1.0
606      NaN   NaN
318      NaN   NaN
```

2.3 Things we can do with df: Gather data induvidually based on Opposition, Ground

- Result vs Toss
- Margin vs Bat
- Target, result, ground - Lowest and Highest

- How many times has ‘Country’ won against ‘Opposition’ and for what score, RPO, Target

[17]:
```python
res_toss = df[['Result','Toss','Opposition','Ground']]
```

[18]:
```python
res_toss.sample(5)
```

[18]:

	Result	Toss	Opposition	Ground
96	tied	NaN	v South Africa	Cardiff
381	lost	NaN	v South Africa	Perth
1279	n/r	NaN	v Pakistan	The Oval
996	won	NaN	v Ireland	Sharjah
1049	lost	won	v England	Brisbane

[19]:
```python
res_toss.isna().sum()
```

[19]:
```
Result           0
Toss          1296
Opposition       0
Ground           0
dtype: int64
```

[20]:
```python
res_toss.dropna(inplace=True)
```

2.4 VENUES - GROUNDS LIST

- The Oval, London
- Trent Bridge, Nottingham
- Sophia Gardens, Cardiff
- County Ground, Bristol
- Rose Bowl, Southampton
- County Ground, Taunton
- Old Trafford, Manchester
- Edgbaston, Birmingham
- Headingley, Leeds
- Lord’s, London
- Riverside Ground, Chester-le-Street

2.5 We are playing in the england so we will analyse only england grounds

[21]:
```python
WC_venue_pitches = ["The Oval, London","Trent Bridge, Nottingham","Sophia␣
↪Gardens, Cardiff","County Ground, Bristol","Rose Bowl, Southampton","County␣
↪Ground, Taunton","Old Trafford, Manchester","Edgbaston,␣
↪Birmingham","Headingley, Leeds","Lord's, London","Riverside Ground,␣
↪Chester-le-Street"]
```

2.6 Total Grounds

[22]:
```
wc_ground_state = []
ODI_grounds = odi_res_df.Ground

for grnd in ODI_grounds:
    for grnds in WC_venue_pitches:
        if grnd in grnds:
            wc_ground_state.append((grnd,grnds))
```

[23]:
```
Ground_names = dict(set(wc_ground_state))
def Full_Ground_names(value):
    return Ground_names[value]
Ground_names
```

[23]:
```
{'The Oval': 'The Oval, London',
 'Nottingham': 'Trent Bridge, Nottingham',
 'Bristol': 'County Ground, Bristol',
 'Manchester': 'Old Trafford, Manchester',
 "Lord's": "Lord's, London",
 'Leeds': 'Headingley, Leeds',
 'Chester-le-Street': 'Riverside Ground, Chester-le-Street',
 'Cardiff': 'Sophia Gardens, Cardiff',
 'Birmingham': 'Edgbaston, Birmingham',
 'Southampton': 'Rose Bowl, Southampton'}
```

2.7 Gathering the data of all ODI's in these WC Venues

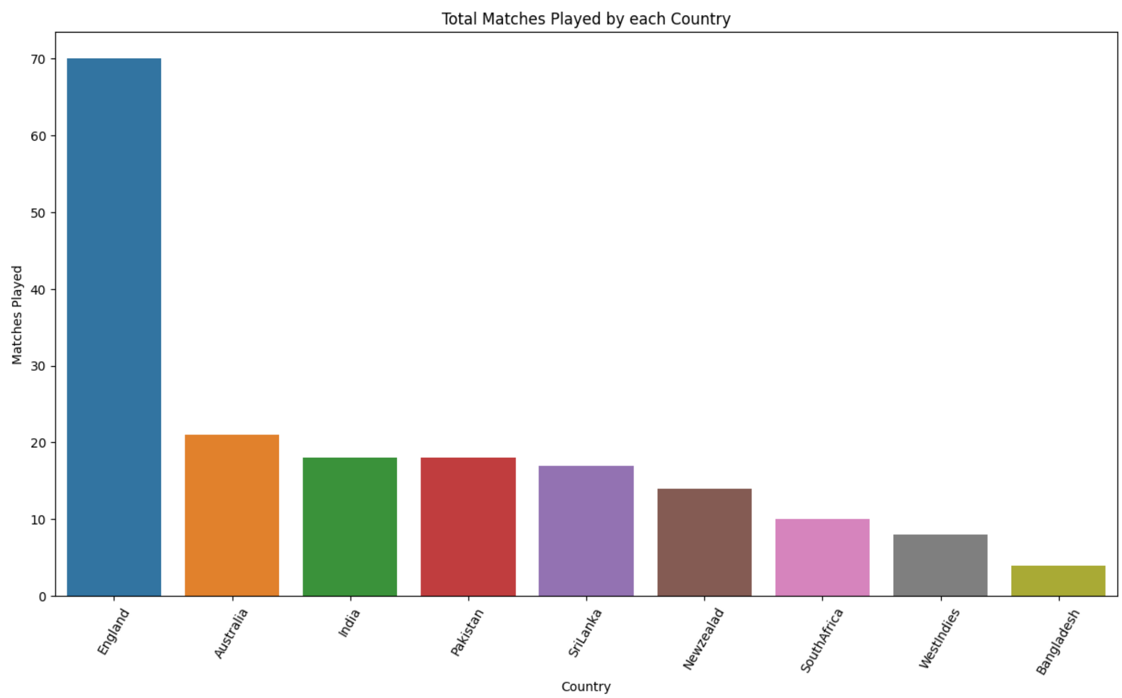
[24]:
```
WC_Grounds_History = odi_res_df[odi_res_df.Ground.isin([Ground[0] for Ground in
 ↪wc_ground_state])]
WC_Grounds_History["Ground"] = WC_Grounds_History.Ground.
 ↪apply(Full_Ground_names)
WC_Grounds_History.head()
```

[24]:
```
    Unnamed: 0 Result     Margin    BR  Toss  Bat     Opposition  \
75         566    won  5 wickets  19.0   won  2nd      v England
76         860   lost  5 wickets  19.0  lost  1st  v New Zealand
77         567    won    86 runs   NaN   won  1st      v England
78         861   lost    86 runs   NaN  lost  2nd  v New Zealand
79         568   lost    34 runs   NaN   won  2nd      v England

                      Ground   Start Date    Match_ID    Country  Country_ID
75            Lord's, London  31 May 2013  ODI # 3360  Newzealad           5
76            Lord's, London  31 May 2013  ODI # 3360    England           1
77    Rose Bowl, Southampton   2 Jun 2013  ODI # 3361  Newzealad           5
78    Rose Bowl, Southampton   2 Jun 2013  ODI # 3361    England           1
79  Trent Bridge, Nottingham   5 Jun 2013  ODI # 3362  Newzealad           5
```

So, now we have the data of matches that were played in WC venues. Now let's analyze the following things,

- How many WC teams have played in these venues before and what are they?
- Which Team has more Win Percentage in these Venues?
- Does Batting First helps winning in these Pitches?
- What should the captain opt for, when he wins the Toss?

[25]:
```
Team_Matches = WC_Grounds_History.Country.value_counts().reset_index()
plt.figure(figsize=(15,8))
sns.barplot(x = "index", y = "Country", data = Team_Matches).set_title("Total␣
↪Matches Played by each Country")
plt.xlabel("Country")
plt.ylabel("Matches Played")
plt.xticks(rotation = 60)
plt.show()
```



- So, England has the benifit of Home conditions and even playing many matches over there, they will get used to those pitches and can understand the conditions of pitches very well.
- After England, it's Aussies which played many mathces in those conditions.

2.8 Team wise winning percentage in england piches

[26]:
```
WC_Grounds_History.sample(5)
```

```
[26]:       Unnamed: 0 Result     Margin     BR  Toss  Bat       Opposition  \
927          386   lost    19 runs    NaN   won  1st       v Pakistan
620          921   lost  8 wickets  154.0   won  1st      v Australia
928          518    won    19 runs    NaN  lost  2nd   v South Africa
1122         827   lost  8 wickets   33.0  lost  1st        v England
102          865    won    10 runs    NaN  lost  1st    v New Zealand

                        Ground   Start Date    Match_ID      Country  \
927       Edgbaston, Birmingham   7 Jun 2017  ODI # 3881  SouthAfrica
620   Old Trafford, Manchester  13 Sep 2015  ODI # 3684      England
928       Edgbaston, Birmingham   7 Jun 2017  ODI # 3881     Pakistan
1122          Headingley, Leeds  17 Jul 2018  ODI # 4018        India
102     Sophia Gardens, Cardiff  16 Jun 2013  ODI # 3373      England

      Country_ID
927            3
620            1
928            7
1122           6
102            1
```

```
[27]: WC_Grounds_History.Result.value_counts()
```

```
[27]: won     79
lost    77
n/r     14
tied     4
aban     4
-        2
Name: Result, dtype: int64
```

- Seems like there are some unwanted datas in the dataset, removing those data.

```
[28]: WC_Grounds_History = WC_Grounds_History[~ WC_Grounds_History.Result.isin(["-"])]
WC_Grounds_History.Result.value_counts()
```

```
[28]: won     79
lost    77
n/r     14
tied     4
aban     4
Name: Result, dtype: int64
```

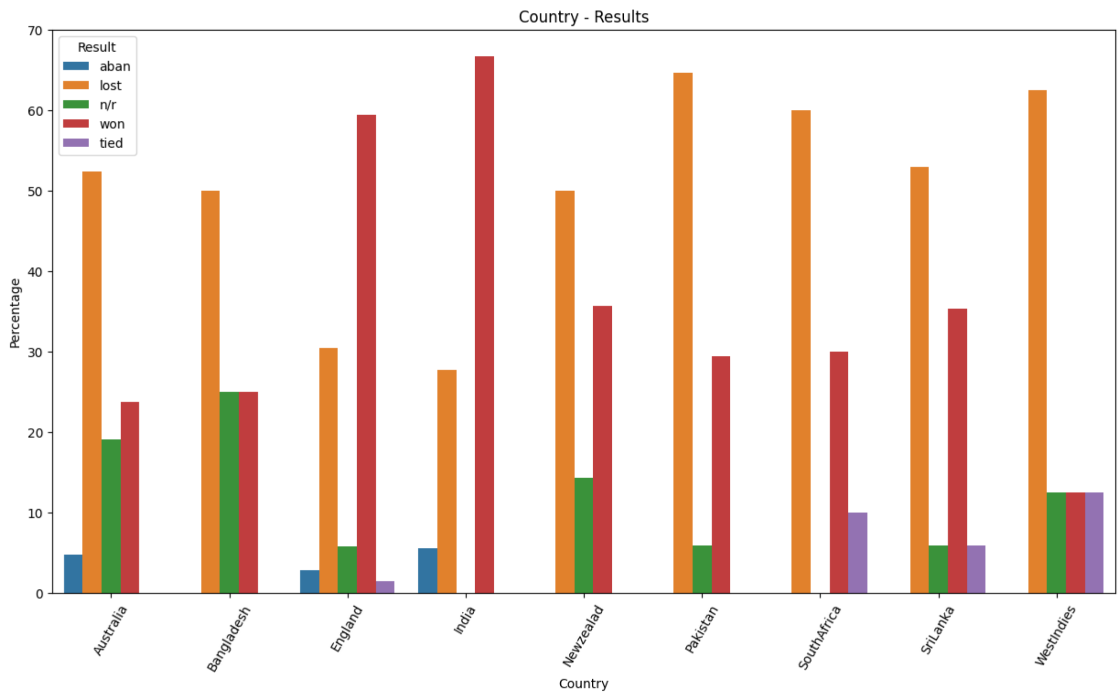
```
[29]: winnings = WC_Grounds_History[["Country","Result"]]
winnings["count"] = 1
Ground_Results_Per_Team = winnings.groupby(["Country","Result"]).
  ↪aggregate(["sum"])
```

```
Ground_Results_Per_Team = Ground_Results_Per_Team.groupby(level=0).apply(lambda␣
  ↪x:100 * x / float(x.sum())).reset_index()
Ground_Results_Per_Team.columns = ["Country","Result","Count"]
Ground_Results_Per_Team.head()
```

[29]:

	Country	Result	Count
0	Australia	aban	4.761905
1	Australia	lost	52.380952
2	Australia	n/r	19.047619
3	Australia	won	23.809524
4	Bangladesh	lost	50.000000

[30]:
```
plt.figure(figsize=(15,8))
sns.barplot(x = "Country", y = "Count", hue = "Result", data =␣
  ↪Ground_Results_Per_Team)
plt.ylabel("Percentage")
plt.title("Country - Results")
plt.xticks(rotation = 60)
plt.show()
```



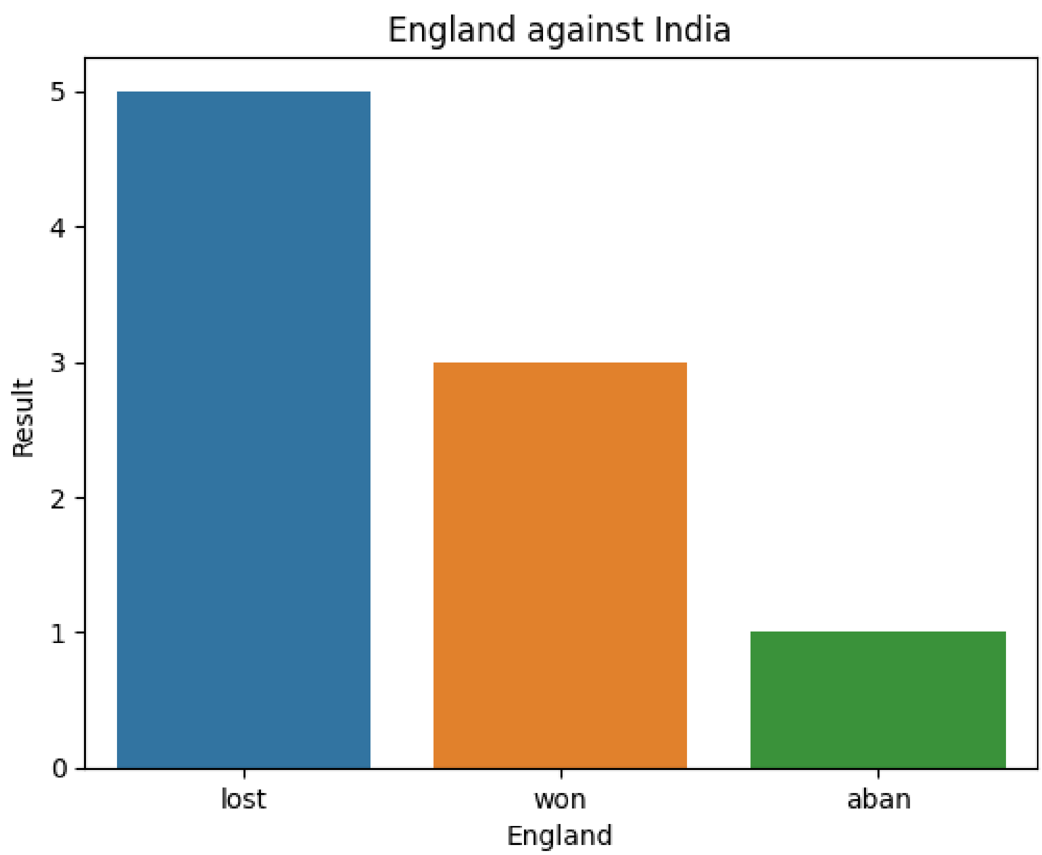
From the above figure, we can understand that,

- India and England have the highest winning percentage compared to that of other Nations
- Pakistan, South Africa, West Indies have the Highest Losing Percentage.

Let's see what happens when the Top Two Teams face?

[31]:

```
India_vs_England = WC_Grounds_History[WC_Grounds_History.Country == "England"]\
[WC_Grounds_History.Opposition.str.contains("India")]
India_vs_England = India_vs_England.Result.value_counts().reset_index()
sns.barplot(x = "index", y = "Result", data = India_vs_England).
 ↪set_title("England against India")
plt.xlabel("England")
plt.show()
```



[32]:

```
WC_Grounds_History.sample(5)
```

[32]:

```
     Unnamed: 0 Result     Margin     BR  Toss  Bat    Opposition  \
915         955    won  8 wickets   16.0   won  2nd  v Bangladesh
724         931   tied          -    NaN   won  2nd   v Sri Lanka
356         891   lost  9 wickets  117.0  lost  1st       v India
987          87   lost   124 runs    NaN   won  2nd     v England
308         886   lost     7 runs    NaN   won  2nd   v Sri Lanka

                    Ground  Start Date    Match_ID     Country  Country_ID
915       The Oval, London  1 Jun 2017  ODI # 3875     England           1
```

```
724  Trent Bridge, Nottingham  21 Jun 2016  ODI # 3751     England           1
356     Edgbaston, Birmingham   2 Sep 2014  ODI # 3523     England           1
987    County Ground, Bristol  24 Sep 2017  ODI # 3915  WestIndies           4
308             Lord's, London  31 May 2014  ODI # 3495     England           1
```

[33]:
```
batter_df.sample(5)
```

[33]:
```
      Unnamed: 0  Bat1 Runs  BF      SR 4s 6s      Opposition        Ground  \
5250        5251    15   15  22   68.18  1  0     v Sri Lanka  Christchurch
5213        5214    13   13  18   72.22  0  0  v South Africa        Napier
2750        2751    46   46  59   77.96  6  0       v England      The Oval
975          976     0    0   1    0.00  0  0    v Bangladesh      Dambulla
7927        7928  110*  110  55  200.00  6  9      v Pakistan   Southampton

       Start Date    Match_ID          Batsman  Player_ID
5250  11 Jan 2015  ODI # 3574  Kane Williamson     277906
5213  29 Feb 2012  ODI # 3252  Kane Williamson     277906
2750  29 Aug 2008  ODI # 2757       Hashim Amla      43906
975   28 Mar 2017  ODI # 3856     Nuwan Pradeep     324358
7927  11 May 2019  ODI # 4133       Jos Buttler     308967
```

[34]:
```
batter_df.isnull().sum()
```

[34]:
```
Unnamed: 0    0
Bat1          0
Runs          0
BF            0
SR            0
4s            0
6s            0
Opposition    0
Ground        0
Start Date    0
Match_ID      0
Batsman       0
Player_ID     0
dtype: int64
```

[35]:
```
batter_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11149 entries, 0 to 11148
Data columns (total 13 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   Unnamed: 0  11149 non-null  int64
 1   Bat1        11149 non-null  object
 2   Runs        11149 non-null  object
```

```
 3   BF          11149 non-null  object
 4   SR          11149 non-null  object
 5   4s          11149 non-null  object
 6   6s          11149 non-null  object
 7   Opposition  11149 non-null  object
 8   Ground      11149 non-null  object
 9   Start Date  11149 non-null  object
 10  Match_ID    11149 non-null  object
 11  Batsman     11149 non-null  object
 12  Player_ID   11149 non-null  int64
dtypes: int64(2), object(11)
memory usage: 1.1+ MB
```

[36]:
```
batter_df['Runs'] = pd.to_numeric(batter_df['Runs'], errors='coerce').fillna(0).
 ↪astype(int)
batter_df['SR'] = pd.to_numeric(batter_df['SR'], errors='coerce').fillna(0).
 ↪astype(int)
batter_df['4s'] = pd.to_numeric(batter_df['4s'], errors='coerce').fillna(0).
 ↪astype(int)
batter_df['6s'] = pd.to_numeric(batter_df['6s'], errors='coerce').fillna(0).
 ↪astype(int)
```

[37]:
```
batter_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11149 entries, 0 to 11148
Data columns (total 13 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   Unnamed: 0  11149 non-null  int64
 1   Bat1        11149 non-null  object
 2   Runs        11149 non-null  int32
 3   BF          11149 non-null  object
 4   SR          11149 non-null  int32
 5   4s          11149 non-null  int32
 6   6s          11149 non-null  int32
 7   Opposition  11149 non-null  object
 8   Ground      11149 non-null  object
 9   Start Date  11149 non-null  object
 10  Match_ID    11149 non-null  object
 11  Batsman     11149 non-null  object
 12  Player_ID   11149 non-null  int64
dtypes: int32(4), int64(2), object(7)
memory usage: 958.2+ KB
```

[38]:
```
batter_df.describe()
```

[38]:
```
         Unnamed: 0          Runs            SR            4s            6s  \
count  11149.00000  11149.000000  11149.000000  11149.000000  11149.000000
mean    5575.00000     22.964391     62.098125      2.080635      0.431788
std     3218.58341     30.694241     54.666471      3.072333      1.077853
min        1.00000      0.000000      0.000000      0.000000      0.000000
25%     2788.00000      0.000000      0.000000      0.000000      0.000000
50%     5575.00000     10.000000     63.000000      1.000000      0.000000
75%     8362.00000     34.000000     94.000000      3.000000      0.000000
max    11149.00000    264.000000    600.000000     33.000000     16.000000

          Player_ID
count  1.114900e+04
mean   2.259088e+05
std    1.942613e+05
min    5.334000e+03
25%    4.749200e+04
50%    2.335140e+05
75%    3.217770e+05
max    1.158100e+06
```

[39]:
```python
batter_df["Runs"].isnull().sum()
```

[39]:
```
0
```

[40]:
```python
batter_df.sample(5)
```

[40]:
```
       Unnamed: 0 Bat1  Runs  BF  SR  4s  6s      Opposition      Ground  \
9800         9801   74    74  95  77   5   2  v West Indies  Basseterre
9411         9412    0     0   9   0   0   0         v India       Dhaka
8790         8791   21    21  28  75   3   0      v Zimbabwe       Dhaka
5890         5891   8*     8  15  53   1   0      v Zimbabwe      Harare
10988       10989    2     2  22   9   0   0       v Ireland     Sharjah

         Start Date    Match_ID            Batsman  Player_ID
9800    13 Jun 2016  ODI # 3745        Steve Smith     267192
9411    24 Jun 2015  ODI # 3661  Mashrafe Mortaza      56007
8790     9 Nov 2015  ODI # 3705   Mushfiqur Rahim      56029
5890    24 Jul 2013  ODI # 3395     Dinesh Karthik      30045
10988    5 Dec 2017  ODI # 3935      Asghar Afghan     320652
```

[41]:
```python
batter_df.drop(batter_df[batter_df.Bat1 == 'DNB'].index, inplace=True)
batter_df.head()
```

[41]:
```
    Unnamed: 0 Bat1  Runs BF  SR  4s  6s   Opposition       Ground  \
5            6   0*     0  8   0   0   0      v India        Dhaka
6            7   0*     0  0   0   0   0    v England     The Oval
9           10   1*     1  3  33   0   0    v England   Nottingham
10          11   0*     0  2   0   0   0  v Australia    Pallekele
```

```
11          12    0     0  2   0   0   0   v Pakistan  Dubai (DSC)

     Start Date    Match_ID        Batsman  Player_ID
5    10 Jan 2010  ODI # 2941  Oshane Thomas      49619
6    28 Jun 2011  ODI # 3165  Oshane Thomas      49619
9     6 Jul 2011  ODI # 3169  Oshane Thomas      49619
10   10 Aug 2011  ODI # 3175  Oshane Thomas      49619
11   11 Nov 2011  ODI # 3212  Oshane Thomas      49619
```

[42]:
```
batter_df.shape
```

[42]:
```
(9106, 13)
```

[43]:
```
batter_df['Bat1'] = batter_df['Bat1'].str.replace('*', '.')
batter_df['SR'] = batter_df['SR'].replace('-', '0')
batter_df['Runs'] = batter_df['Runs'].replace('-', '0')
batter_df['4s'] = batter_df['4s'].replace('-', '0')
batter_df['6s'] = batter_df['6s'].replace('-', '0')
batter_df.head()
```

[43]:
```
    Unnamed: 0 Bat1  Runs BF  SR  4s  6s   Opposition       Ground  \
5            6   0.     0  8   0   0   0      v India        Dhaka
6            7   0.     0  0   0   0   0    v England     The Oval
9           10   1.     1  3  33   0   0    v England   Nottingham
10          11   0.     0  2   0   0   0  v Australia    Pallekele
11          12    0     0  2   0   0   0   v Pakistan  Dubai (DSC)

     Start Date    Match_ID        Batsman  Player_ID
5    10 Jan 2010  ODI # 2941  Oshane Thomas      49619
6    28 Jun 2011  ODI # 3165  Oshane Thomas      49619
9     6 Jul 2011  ODI # 3169  Oshane Thomas      49619
10   10 Aug 2011  ODI # 3175  Oshane Thomas      49619
11   11 Nov 2011  ODI # 3212  Oshane Thomas      49619
```

[44]:
```
batter_df['SR']=batter_df['SR'].astype(float)
batter_df['Runs']=batter_df['Runs'].astype(float)
batter_df['4s']=batter_df['4s'].astype(float)
batter_df['6s']=batter_df['6s'].astype(float)
```

[45]:
```
batter_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 9106 entries, 5 to 11148
Data columns (total 13 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   Unnamed: 0  9106 non-null   int64
 1   Bat1        9106 non-null   object
```

```
 2   Runs        9106 non-null   float64
 3   BF          9106 non-null   object
 4   SR          9106 non-null   float64
 5   4s          9106 non-null   float64
 6   6s          9106 non-null   float64
 7   Opposition  9106 non-null   object
 8   Ground      9106 non-null   object
 9   Start Date  9106 non-null   object
 10  Match_ID    9106 non-null   object
 11  Batsman     9106 non-null   object
 12  Player_ID   9106 non-null   int64
dtypes: float64(4), int64(2), object(7)
memory usage: 996.0+ KB
```

[46]:
```
Top_10_batters = batter_df['Batsman'].value_counts()[:10]
Top_10_batters
```

[46]:
```
MS Dhoni            294
Chris Gayle         288
Shoaib Malik        255
Virat Kohli         222
Ross Taylor         209
Mohammad Hafeez     208
Eoin Morgan         208
Rohit Sharma        202
Mushfiqur Rahim     194
Tamim Iqbal         193
Name: Batsman, dtype: int64
```

[47]:
```
induvidual_player = batter_df.query('Batsman =="Virat Kohli "')
induvidual_player
```

[47]:
```
      Unnamed: 0 Bat1   Runs   BF     SR    4s   6s   Opposition  \
6676        6677   12   12.0   22   54.0   1.0  0.0  v Sri Lanka
6677        6678   37   37.0   67   55.0   6.0  0.0  v Sri Lanka
6678        6679   25   25.0   38   65.0   4.0  0.0  v Sri Lanka
6679        6680   54   54.0   66   81.0   7.0  0.0  v Sri Lanka
6680        6681   31   31.0   46   67.0   3.0  1.0  v Sri Lanka
…              …  …      …  …      …    …  …            …
6898        6899   44   44.0   45   97.0   6.0  1.0  v Australia
6899        6900  116  116.0  120   96.0  10.0  0.0  v Australia
6900        6901  123  123.0   95  129.0  16.0  1.0  v Australia
6901        6902    7    7.0    6  116.0   1.0  0.0  v Australia
6902        6903   20   20.0   22   90.0   2.0  0.0  v Australia

                Ground   Start Date    Match_ID       Batsman  Player_ID
6676          Dambulla  18 Aug 2008  ODI # 2742  Virat Kohli      253802
6677          Dambulla  20 Aug 2008  ODI # 2745  Virat Kohli      253802
```

```
6678        Colombo (RPS)  24 Aug 2008  ODI # 2750  Virat Kohli      253802
6679        Colombo (RPS)  27 Aug 2008  ODI # 2755  Virat Kohli      253802
6680        Colombo (RPS)  29 Aug 2008  ODI # 2756  Virat Kohli      253802
…                     …            …           …           …        …
6898  Hyderabad (Deccan)    2 Mar 2019  ODI # 4102  Virat Kohli      253802
6899               Nagpur   5 Mar 2019  ODI # 4106  Virat Kohli      253802
6900               Ranchi   8 Mar 2019  ODI # 4109  Virat Kohli      253802
6901               Mohali  10 Mar 2019  ODI # 4111  Virat Kohli      253802
6902                Delhi  13 Mar 2019  ODI # 4113  Virat Kohli      253802

[222 rows x 13 columns]
```

[48]:

```python
print("The highest number of score for this batsman is: ")
print(induvidual_player['Runs'].max())
print("The highest Strike Rate for this batsman is: ")
print(induvidual_player['SR'].max())
print("The most number of 4s for this batsman is: ")
print(induvidual_player['4s'].max())
print("The most number of 6s score for this batsman is: ")
print(induvidual_player['6s'].max())
```

```
The highest number of score for this batsman is:
183.0
The highest Strike Rate for this batsman is:
209.0
The most number of 4s for this batsman is:
22.0
The most number of 6s score for this batsman is:
7.0
```

[49]:

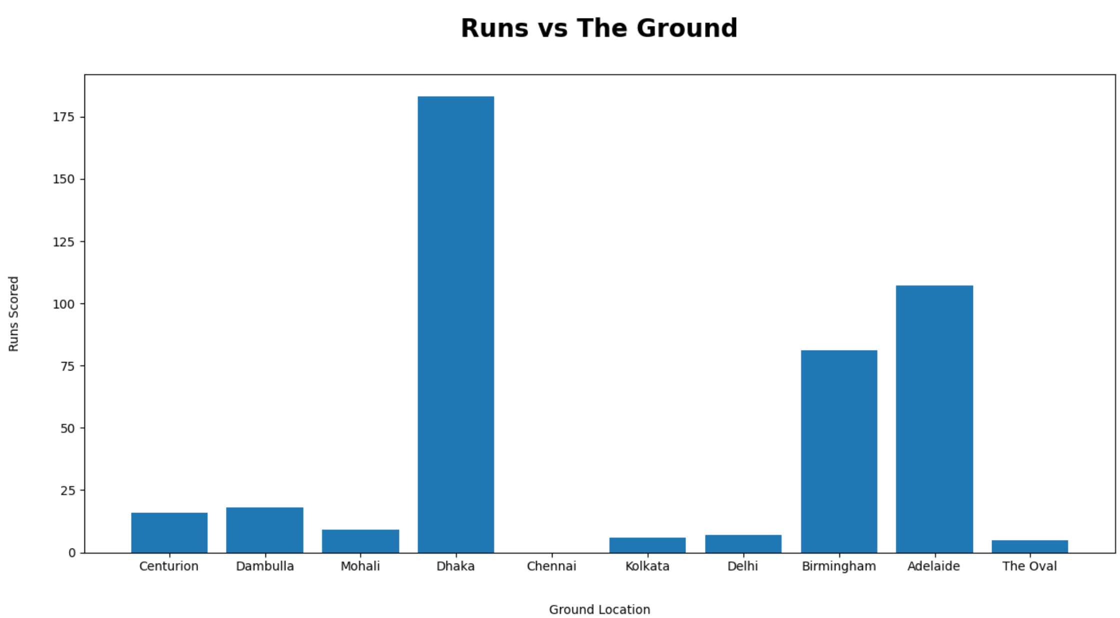
```python
against_pak = induvidual_player.query('Opposition == "v Pakistan"')
against_pak
```

[49]:

```
      Unnamed: 0 Bat1   Runs   BF     SR    4s   6s  Opposition      Ground  \
6682        6683   16   16.0   24   66.0   1.0  0.0  v Pakistan   Centurion
6704        6705   18   18.0   27   66.0   1.0  0.0  v Pakistan    Dambulla
6728        6729    9    9.0   21   42.0   0.0  0.0  v Pakistan      Mohali
6760        6761  183  183.0  148  123.0  22.0  1.0  v Pakistan       Dhaka
6766        6767    0    0.0    5    0.0   0.0  0.0  v Pakistan     Chennai
6767        6768    6    6.0    9   66.0   1.0  0.0  v Pakistan     Kolkata
6768        6769    7    7.0   17   41.0   1.0  0.0  v Pakistan       Delhi
6776        6777  22.   22.0   27   81.0   3.0  0.0  v Pakistan  Birmingham
6808        6809    5    5.0   11   45.0   0.0  0.0  v Pakistan       Dhaka
6826        6827  107  107.0  126   84.0   8.0  0.0  v Pakistan    Adelaide
6855        6856  81.   81.0   68  119.0   6.0  3.0  v Pakistan  Birmingham
6859        6860    5    5.0    9   55.0   0.0  0.0  v Pakistan    The Oval

       Start Date    Match_ID       Batsman  Player_ID
```

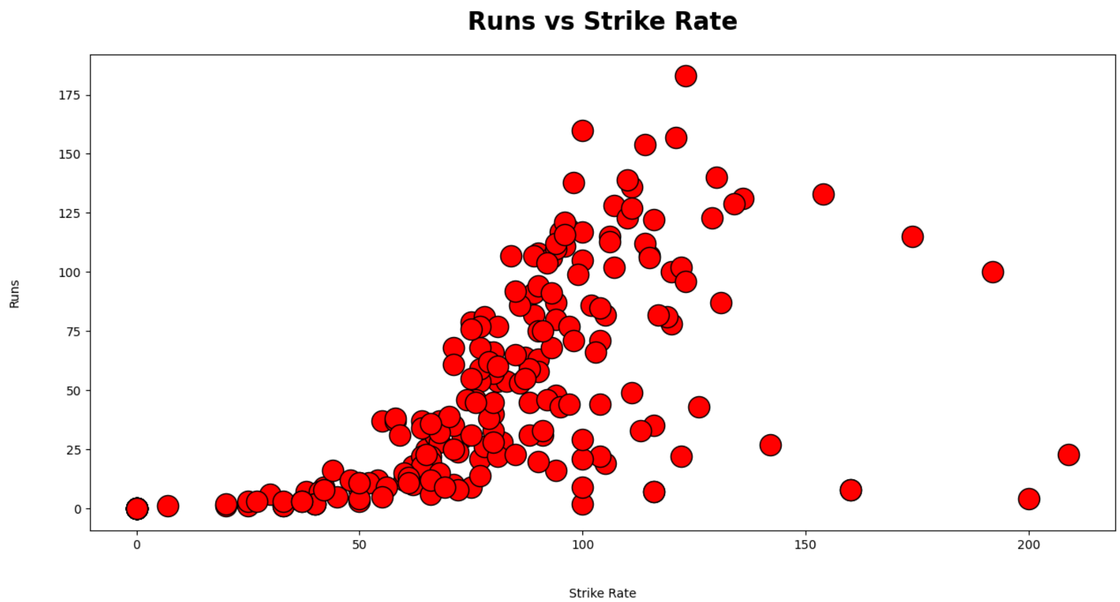
```
6682  26 Sep 2009  ODI # 2898  Virat Kohli      253802
6704  19 Jun 2010  ODI # 2996  Virat Kohli      253802
6728  30 Mar 2011  ODI # 3147  Virat Kohli      253802
6760  18 Mar 2012  ODI # 3263  Virat Kohli      253802
6766  30 Dec 2012  ODI # 3314  Virat Kohli      253802
6767   3 Jan 2013  ODI # 3315  Virat Kohli      253802
6768   6 Jan 2013  ODI # 3316  Virat Kohli      253802
6776  15 Jun 2013  ODI # 3372  Virat Kohli      253802
6808   2 Mar 2014  ODI # 3479  Virat Kohli      253802
6826  15 Feb 2015  ODI # 3602  Virat Kohli      253802
6855   4 Jun 2017  ODI # 3878  Virat Kohli      253802
6859  18 Jun 2017  ODI # 3894  Virat Kohli      253802
```

[50]:
```
plt.figure(figsize=(15,7))
x = against_pak['Ground']
y = against_pak['Runs']
plt.xlabel('Ground Location', labelpad=25)
plt.ylabel('Runs Scored', labelpad=25)
plt.title('Runs vs The Ground', fontweight='bold', pad=30, fontsize=20)
plt.bar(x, y)
plt.show()
```



[51]:
```
#strike rate vs the score of player in each match
plt.figure(figsize=(15,7))
x = induvidual_player['SR']
y = induvidual_player['Runs']
plt.xlabel('Strike Rate', labelpad=30)
```

```
plt.ylabel('Runs', labelpad=30)
plt.title('Runs vs Strike Rate', fontweight='bold', pad=20, fontsize=20)
plt.scatter(x, y, color='red', s=300, edgecolor='black')
plt.show()
```



[52]:
```
bowler_df.sample(5)
```

[52]:
```
       Unnamed: 0 Overs Mdns Runs Wkts  Econ    Ave   SR      Opposition  \
5514         5515  10.0    0   39    1  3.90  39.00 60.0  v South Africa
1363         1364   2.0    0    4    0  2.00      -    -   v New Zealand
9777         9778     -    -    -    -     -      -    -   v West Indies
6522         6523     -    -    -    -     -      -    -   v West Indies
1236         1237     -    -    -    -     -      -    -      v Pakistan

             Ground   Start Date    Match_ID               Bowler  Player_ID
5514       The Oval  11 Jun 2017  ODI # 3886      Ravindra Jadeja     234675
1363        Cardiff   9 Jun 2013  ODI # 3366       Thisara Perera     233514
9777     Providence   5 Jun 2016  ODI # 3740          Steve Smith     267192
6522  Port of Spain   8 Jun 2011  ODI # 3160         Rohit Sharma      34102
1236        Sharjah  23 Oct 2017  ODI # 3930  Milinda Siriwardana     222354
```

[53]:
```
bowler_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11118 entries, 0 to 11117
Data columns (total 14 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
```

```
 0   Unnamed: 0  11118 non-null  int64
 1   Overs       11118 non-null  object
 2   Mdns        11118 non-null  object
 3   Runs        11118 non-null  object
 4   Wkts        11118 non-null  object
 5   Econ        11118 non-null  object
 6   Ave         11118 non-null  object
 7   SR          11118 non-null  object
 8   Opposition  11118 non-null  object
 9   Ground      11118 non-null  object
 10  Start Date  11118 non-null  object
 11  Match_ID    11118 non-null  object
 12  Bowler      11118 non-null  object
 13  Player_ID   11118 non-null  int64
dtypes: int64(2), object(12)
memory usage: 1.2+ MB
```

[54]:
```
bowler_df.drop(bowler_df[bowler_df.Overs == '-'].index, inplace=True)
bowler_df.head()
```

[54]:
```
   Unnamed: 0 Overs Mdns Runs Wkts  Econ    Ave    SR    Opposition   Ground  \
0           1   8.0    0   57    0  7.12      -     -       v India   Nagpur
1           2  10.0    0   55    2  5.50  27.50  30.0       v India  Kolkata
3           4   9.0    1   63    2  7.00  31.50  27.0  v Bangladesh    Dhaka
4           5   8.0    1   48    0  6.00      -     -       v India    Dhaka
5           6  10.0    0   75    0  7.50      -     -       v India    Dhaka

    Start Date    Match_ID          Bowler  Player_ID
0  18 Dec 2009  ODI # 2933  Suranga Lakmal      49619
1  24 Dec 2009  ODI # 2935  Suranga Lakmal      49619
3   4 Jan 2010  ODI # 2937  Suranga Lakmal      49619
4   5 Jan 2010  ODI # 2938  Suranga Lakmal      49619
5  10 Jan 2010  ODI # 2941  Suranga Lakmal      49619
```

[55]:
```
bowler_df.shape
```

[55]:
```
(5848, 14)
```

[56]:
```
bowler_df['Mdns'] = bowler_df['Mdns'].str.replace('-', '0')
bowler_df['Runs'] = bowler_df['Runs'].str.replace('-', '0')
bowler_df['Wkts'] = bowler_df['Wkts'].str.replace('-', '0')
bowler_df['Econ'] = bowler_df['Econ'].str.replace('-', '0')
bowler_df['Ave'] = bowler_df['Ave'].str.replace('-', '0')
bowler_df['SR'] = bowler_df['SR'].str.replace('-', '0')
```

[57]:
```
bowler_df['Overs'] = bowler_df['Overs'].astype(float)
bowler_df['Mdns'] = bowler_df['Mdns'].astype(float)
bowler_df['Runs'] = bowler_df['Runs'].astype(float)
```

```python
bowler_df['Wkts'] = bowler_df['Wkts'].astype(float)
bowler_df['Econ'] = bowler_df['Econ'].astype(float)
bowler_df['Ave'] = bowler_df['Ave'].astype(float)
bowler_df['SR'] = bowler_df['SR'].astype(float)
bowler_df.dtypes
```

[57]:
```
Unnamed: 0      int64
Overs         float64
Mdns          float64
Runs          float64
Wkts          float64
Econ          float64
Ave           float64
SR            float64
Opposition     object
Ground         object
Start Date     object
Match_ID       object
Bowler         object
Player_ID       int64
dtype: object
```

2.9 Highest Number of Wickets

[58]:
```python
bowler_df.loc[bowler_df['Wkts']==bowler_df['Wkts'].max()]
```

[58]:
```
       Unnamed: 0  Overs  Mdns  Runs  Wkts  Econ   Ave   SR     Opposition  \
2056         2057    9.0   0.0  45.0   7.0  5.00  6.42  7.7  v West Indies
4933         4934   10.0   3.0  34.0   7.0  3.40  4.85  8.5  v West Indies
5044         5045    9.0   0.0  33.0   7.0  3.66  4.71  7.7      v England
11034       11035    8.4   1.0  18.0   7.0  2.07  2.57  7.4  v West Indies

             Ground   Start Date    Match_ID        Bowler  Player_ID
2056     Basseterre  15 Jun 2016  ODI # 3747   Imran Tahir      40618
4933   Christchurch  23 Dec 2017  ODI # 3944   Trent Boult     277912
5044     Wellington  20 Feb 2015  ODI # 3607   Tim Southee     232364
11034    Gros Islet   9 Jun 2017  ODI # 3884  Rashid Khan      793463
```

2.10 Highest Number of Madiens

[59]:
```python
bowler_df.loc[bowler_df['Mdns']==bowler_df['Mdns'].max()]
```

[59]:
```
     Unnamed: 0  Overs  Mdns  Runs  Wkts  Econ    Ave    SR   Opposition  \
67           68   10.0   4.0  13.0   4.0  1.30   3.25  15.0      v India
193         194   10.0   4.0  28.0   3.0  2.80   9.33  20.0   v Pakistan
200         201    6.0   4.0  14.0   1.0  2.33  14.00  36.0   v Pakistan
867         868   10.0   4.0  13.0   4.0  1.30   3.25  15.0   v Pakistan
```

```
982          983   10.0   4.0  37.0   2.0  3.70  18.50  30.0       v India
2231        2232    8.0   4.0  19.0   0.0  2.37   0.00   0.0  v Bangladesh
4952        4953   10.0   4.0  21.0   5.0  2.10   4.20  12.0       v India
5320        5321    9.0   4.0  23.0   1.0  2.55  23.00  54.0    v Pakistan
5644        5645    8.0   4.0  24.0   2.0  3.00  12.00  24.0   v Sri Lanka
9052        9053   10.0   4.0  13.0   1.0  1.30  13.00  60.0    v Scotland
9099        9100   10.0   4.0  11.0   3.0  1.10   3.66  20.0    v Zimbabwe
9101        9102    8.0   4.0  15.0   3.0  1.87   5.00  16.0    v Zimbabwe
9276        9277   10.0   4.0  25.0   3.0  2.50   8.33  20.0       v Kenya
9312        9313   10.0   4.0  22.0   3.0  2.20   7.33  20.0     v Ireland
10657      10658    8.3   4.0  10.0   2.0  1.17   5.00  25.5       v Kenya
10789      10790    8.2   4.0  26.0   4.0  3.12   6.50  12.5       v Kenya

              Ground   Start Date    Match_ID            Bowler  Player_ID
67        Dharamsala  10 Dec 2017  ODI # 3939    Suranga Lakmal      49619
193         The Oval   7 Jun 2013  ODI # 3364       Kemar Roach     230553
200       Providence  16 Jul 2013  ODI # 3390       Kemar Roach     230553
867       Providence  14 Jul 2013  ODI # 3389     Jason Holder      391485
982       Dharamsala  10 Dec 2017  ODI # 3939     Nuwan Pradeep     324358
2231           Dhaka  14 Mar 2008  ODI # 2692       Dale Steyn       47492
4952        Hamilton  31 Jan 2019  ODI # 4091       Trent Boult     277912
5320           Delhi   6 Jan 2013  ODI # 3316     Mohammed Shami    481896
5644   Port of Spain  11 Jul 2013  ODI # 3388  Bhuvneshwar Kumar    326016
9052      Chattogram  15 Dec 2006  ODI # 2465   Shakib Al Hasan      56143
9099           Dhaka  19 Jan 2009  ODI # 2797   Shakib Al Hasan      56143
9101           Dhaka  23 Jan 2009  ODI # 2801   Shakib Al Hasan      56143
9276   Nairobi (Gym)  12 Aug 2006  ODI # 2402  Mashrafe Mortaza      56007
9312           Dhaka  18 Mar 2008  ODI # 2693  Mashrafe Mortaza      56007
10657        Sharjah   4 Oct 2013  ODI # 3418     Mohammad Nabi      25913
10789  Nairobi (Gym)   7 Oct 2010  ODI # 3052      Hamid Hassan     311427
```

2.11 Gathering Data of one opponent induvidually

[60]:
```python
opponent = bowler_df.query('Opposition =="v India"')
opponent
```

[60]:
```
       Unnamed: 0  Overs  Mdns  Runs  Wkts  Econ   Ave    SR Opposition  \
0               1    8.0   0.0  57.0   0.0  7.12   0.0   0.0    v India
1               2   10.0   0.0  55.0   2.0  5.50  27.5  30.0    v India
4               5    8.0   1.0  48.0   0.0  6.00   0.0   0.0    v India
5               6   10.0   0.0  75.0   0.0  7.50   0.0   0.0    v India
12             13   10.0   1.0  67.0   1.0  6.70  67.0  60.0    v India
…               …      …     …     …     …     …     …     …          …
10736       10737   10.0   0.0  40.0   2.0  4.00  20.0  30.0    v India
10821       10822    5.0   0.0  25.0   0.0  5.00   0.0   0.0    v India
11005       11006   10.0   0.0  53.0   2.0  5.30  26.5  30.0    v India
11059       11060    9.5   0.0  41.0   2.0  4.16  20.5  29.5    v India
```

```
11113       11114    4.0    0.0   41.0    0.0   10.25    0.0    0.0     v India

             Ground   Start Date    Match_ID          Bowler  Player_ID
0            Nagpur  18 Dec 2009  ODI # 2933  Suranga Lakmal      49619
1           Kolkata  24 Dec 2009  ODI # 2935  Suranga Lakmal      49619
4             Dhaka   5 Jan 2010  ODI # 2938  Suranga Lakmal      49619
5             Dhaka  10 Jan 2010  ODI # 2941  Suranga Lakmal      49619
12            Dhaka  13 Mar 2012  ODI # 3259  Suranga Lakmal      49619
…               …          …           …             …        …
10736  Dubai (DSC)  25 Sep 2018  ODI # 4046   Mohammad Nabi      25913
10821         Dhaka   5 Mar 2014  ODI # 3483   Dawlat Zadran     516561
11005  Dubai (DSC)  25 Sep 2018  ODI # 4046      Aftab Alam     440963
11059  Dubai (DSC)  25 Sep 2018  ODI # 4046     Rashid Khan     793463
11113  Dubai (DSC)  25 Sep 2018  ODI # 4046  Gulbadin Naib      352048

[680 rows x 14 columns]
```

[61]:

```python
print("The maximum runs conceeded against this team is: ")
print(bowler_df.loc[bowler_df['Runs'].max()])
print("--------------------------------------------------")
print("The maximum maidens conceeded against this team is: ")
print(bowler_df.loc[bowler_df['Mdns'].max()])
print("--------------------------------------------------")
print("The maximum Wickets taken against this team is: ")
print(bowler_df.loc[bowler_df['Wkts'].max()])
print("--------------------------------------------------")
print("The maximum Economy maintained against this team is: ")
print(bowler_df.loc[bowler_df['Econ'].max()])
```

```
The maximum runs conceeded against this team is:
Unnamed: 0                107
Overs                     4.0
Mdns                      0.0
Runs                     21.0
Wkts                      0.0
Econ                     5.25
Ave                       0.0
SR                        0.0
Opposition        v Australia
Ground              Kingstown
Start Date        16 Mar 2012
Match_ID           ODI # 3262
Bowler         Andre Russell
Player_ID              276298
Name: 106, dtype: object
--------------------------------------------------
The maximum maidens conceeded against this team is:
Unnamed: 0                   5
```

```
Overers                     8.0
```

2.12 Top 20 ballers with highest macthes/data

[62]:
```
new = bowler_df['Bowler'].value_counts()[:20]
new
```

[62]:
```
Shoaib Malik          213
Lasith Malinga        212
Mashrafe Mortaza      209
Shakib Al Hasan       195
Chris Gayle           195
Mohammad Hafeez       169
Angelo Mathews        154
Ravindra Jadeja       147
Thisara Perera        144
Tim Southee           137
Mahmudullah           132
JP Duminy             131
Dale Steyn            124
Mohammad Nabi         107
Bhuvneshwar Kumar     104
Imran Tahir            96
Rubel Hossain          95
Jason Holder           93
Moeen Ali              89
Kemar Roach            84
Name: Bowler, dtype: int64
```

[63]:
```
induvidual_bowler = bowler_df.query('Bowler =="Ravindra Jadeja"')
induvidual_bowler
```

[63]:
```
      Unnamed: 0  Overs  Mdns  Runs  Wkts  Econ    Ave    SR     Opposition  \
5383        5384    6.0   0.0  40.0   0.0  6.66   0.00   0.0    v Sri Lanka
5384        5385    7.0   1.0  34.0   0.0  4.85   0.00   0.0  v West Indies
5385        5386    2.0   0.0  12.0   0.0  6.00   0.00   0.0  v West Indies
5386        5387    9.0   0.0  39.0   1.0  4.33  39.00  54.0    v Australia
5387        5388    6.3   0.0  35.0   3.0  5.38  11.66  13.0    v Australia
…          …    …    …   …   …    …    …   …         …
5529        5530    9.0   0.0  53.0   0.0  5.88   0.00   0.0    v Australia
5530        5531   10.0   0.0  33.0   0.0  3.30   0.00   0.0    v Australia
5531        5532   10.0   0.0  48.0   1.0  4.80  48.00  60.0    v Australia
5532        5533   10.0   0.0  64.0   0.0  6.40   0.00   0.0    v Australia
5533        5534   10.0   0.0  45.0   2.0  4.50  22.50  30.0    v Australia

            Ground   Start Date    Match_ID           Bowler  Player_ID
5383  Colombo (RPS)   8 Feb 2009  ODI # 2818  Ravindra Jadeja     234675
5384       Kingston  26 Jun 2009  ODI # 2852  Ravindra Jadeja     234675
5385       Kingston  28 Jun 2009  ODI # 2853  Ravindra Jadeja     234675
5386       Vadodara  25 Oct 2009  ODI # 2913  Ravindra Jadeja     234675
```

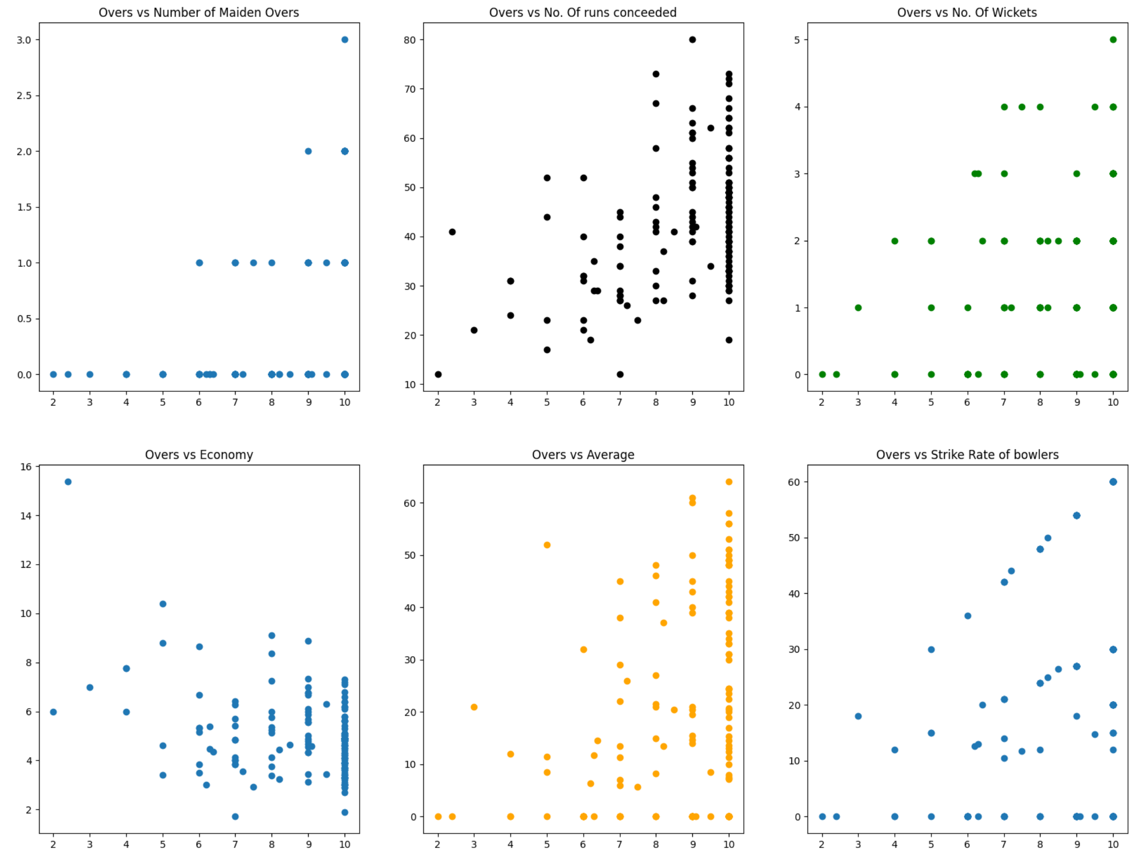
```
5387               Nagpur  28 Oct 2009  ODI # 2915  Ravindra Jadeja     234675
…                       …           …           …             …         …
5529            Melbourne  18 Jan 2019  ODI # 4079  Ravindra Jadeja     234675
5530  Hyderabad (Deccan)    2 Mar 2019  ODI # 4102  Ravindra Jadeja     234675
5531               Nagpur   5 Mar 2019  ODI # 4106  Ravindra Jadeja     234675
5532               Ranchi   8 Mar 2019  ODI # 4109  Ravindra Jadeja     234675
5533                Delhi  13 Mar 2019  ODI # 4113  Ravindra Jadeja     234675

[147 rows x 14 columns]
```

2.13 Storing the data into variables

[64]:
```
x = induvidual_bowler['Overs']
y1 = induvidual_bowler['Mdns']
y2 = induvidual_bowler['Runs']
y3 = induvidual_bowler['Wkts']
y4 = induvidual_bowler['Econ']
y5 = induvidual_bowler['Ave']
y6 = induvidual_bowler['SR']
```

2.14 Plotting the varuous graphs with Overs as X axis to understand the complete performance of a bowler

[65]:
```
fig, ((ax1, ax2, ax3), (ax4, ax5, ax6)) = plt.subplots(2, 3, figsize=(20, 15))
ax1.scatter(x, y1)
ax1.set_title('Overs vs Number of Maiden Overs')
ax2.scatter(x, y2, color='black')
ax2.set_title('Overs vs No. Of runs conceeded')
ax3.scatter(x, y3, color='green')
ax3.set_title('Overs vs No. Of Wickets')
ax4.scatter(x, y4)
ax4.set_title('Overs vs Economy')
ax5.scatter(x, y5, color='orange')
ax5.set_title('Overs vs Average')
ax6.scatter(x, y6)
ax6.set_title('Overs vs Strike Rate of bowlers')
plt.show()
```



2.15 Gathering Data of one opponent induvidually

[66]:
```
bdf_induvidual_opponence = induvidual_bowler.query('Opposition =="v Pakistan"')
bdf_induvidual_opponence
```

[66]:
```
      Unnamed: 0  Overs  Mdns  Runs  Wkts  Econ    Ave    SR  Opposition  \
5410        5411   10.0   0.0  43.0   1.0  4.30  43.00  60.0  v Pakistan
5441        5442   10.0   1.0  41.0   3.0  4.10  13.66  20.0  v Pakistan
5442        5443   10.0   2.0  19.0   1.0  1.90  19.00  60.0  v Pakistan
5450        5451    8.0   1.0  30.0   2.0  3.75  15.00  24.0  v Pakistan
5482        5483   10.0   1.0  61.0   0.0  6.10   0.00   0.0  v Pakistan
5494        5495   10.0   0.0  56.0   1.0  5.60  56.00  60.0  v Pakistan
5512        5513    8.0   0.0  43.0   2.0  5.37  21.50  24.0  v Pakistan
5516        5517    8.0   0.0  67.0   0.0  8.37   0.00   0.0  v Pakistan
5520        5521    9.0   0.0  50.0   0.0  5.55   0.00   0.0  v Pakistan

        Ground   Start Date    Match_ID           Bowler  Player_ID
5410  Dambulla  19 Jun 2010  ODI # 2996  Ravindra Jadeja     234675
5441   Kolkata   3 Jan 2013  ODI # 3315  Ravindra Jadeja     234675
5442     Delhi   6 Jan 2013  ODI # 3316  Ravindra Jadeja     234675
```

5450	Birmingham	15 Jun 2013	ODI # 3372	Ravindra Jadeja	234675
5482	Dhaka	2 Mar 2014	ODI # 3479	Ravindra Jadeja	234675
5494	Adelaide	15 Feb 2015	ODI # 3602	Ravindra Jadeja	234675
5512	Birmingham	4 Jun 2017	ODI # 3878	Ravindra Jadeja	234675
5516	The Oval	18 Jun 2017	ODI # 3894	Ravindra Jadeja	234675
5520	Dubai (DSC)	23 Sep 2018	ODI # 4044	Ravindra Jadeja	234675