IPL Data Analysis and Visualization Assignment

In this project, I worked on IPL Data Analysis and Visualization, where I explored some interesting insights from IPL match data such as most runs by a player, most wickets taken by a player, and much more from IPL seasons 2008-2017.

Importing Libraries

```
In [165]: import numpy as np
          import pandas as pd
          import matplotlib.pyplot as plt
          import seaborn as sns
          import sqlalchemy, pyodbc, os
```

Importing IPL Dataset

```
In [166]: match_data1 = pd.read_csv("D:/Resumes/Companies/1. VIT/Headstrait/Dataset/matches.csv")
          ball_data = pd.read_csv("D:/Resumes/Companies/1. VIT/Headstrait/Dataset/deliveries.csv")
```

```
In [206]: match_data1.head() # prints the first five rows
```

Out[206]:

	id	season	city	date	team1	team2	toss_winner	toss_decision	result	dl_applied	winner	win_by_runs	win_by_wickets	player_of_m
0	1	2017	Hyderabad	05-04-2017	Sunrisers Hyderabad	Royal Challengers Bangalore	Royal Challengers Bangalore	field	normal	0	Sunrisers Hyderabad	35	0	Yuvraj S
1	2	2017	Pune	06-04-2017	Mumbai Indians	Rising Pune Supergiant	Rising Pune Supergiant	field	normal	0	Rising Pune Supergiant	0	7	SPD S
2	3	2017	Rajkot	07-04-2017	Gujarat Lions	Kolkata Knight Riders	Kolkata Knight Riders	field	normal	0	Kolkata Knight Riders	0	10	CA
3	4	2017	Indore	08-04-2017	Rising Pune Supergiant	Kings XI Punjab	Kings XI Punjab	field	normal	0	Kings XI Punjab	0	6	GJ Ma
4	5	2017	Bangalore	08-04-2017	Royal Challengers Bangalore	Delhi Daredevils	Royal Challengers Bangalore	bat	normal	0	Royal Challengers Bangalore	15	0	KM Ja

```
In [168]: ball_data.head()
```

Out[168]:

	match_id	inning	batting_team	bowling_team	over	ball	batsman	non_striker	bowler	is_super_over	...	bye_runs	legbye_runs	noball_runs	penalty_run:
0	1	1	Sunrisers Hyderabad	Royal Challengers Bangalore	1	1	DA Warner	S Dhawan	TS Mills	0	...	0	0	0	(
1	1	1	Sunrisers Hyderabad	Royal Challengers Bangalore	1	2	DA Warner	S Dhawan	TS Mills	0	...	0	0	0	(
2	1	1	Sunrisers Hyderabad	Royal Challengers Bangalore	1	3	DA Warner	S Dhawan	TS Mills	0	...	0	0	0	(
3	1	1	Sunrisers Hyderabad	Royal Challengers Bangalore	1	4	DA Warner	S Dhawan	TS Mills	0	...	0	0	0	(
4	1	1	Sunrisers Hyderabad	Royal Challengers Bangalore	1	5	DA Warner	S Dhawan	TS Mills	0	...	0	0	0	(

5 rows × 21 columns

Checking IPL Dataset Attributes

Before proceeding with the dataset, it is essential to know what columns are present in the dataset, their count, and data type. I used the Pandas info() function for this.

```
In [209]: match_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 636 entries, 0 to 635
Data columns (total 18 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   id               636 non-null    int64 
 1   season           636 non-null    int64 
 2   city             629 non-null    object
 3   date             636 non-null    object
 4   team1            636 non-null    object
 5   team2            636 non-null    object
 6   toss_winner      636 non-null    object
 7   toss_decision    636 non-null    object
 8   result           636 non-null    object
 9   dl_applied       636 non-null    int64 
 10  winner           633 non-null    object
 11  win_by_runs      636 non-null    int64 
 12  win_by_wickets   636 non-null    int64 
 13  player_of_match  633 non-null    object
 14  venue            636 non-null    object
 15  umpire1          635 non-null    object
 16  umpire2          635 non-null    object
 17  Season           636 non-null    int64 
dtypes: int64(6), object(12)
memory usage: 89.6+ KB
```

```
In [211]: ball_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150460 entries, 0 to 150459
Data columns (total 21 columns):
 #   Column            Non-Null Count   Dtype 
---  ------            --------------   ----- 
 0   match_id          150460 non-null  int64 
 1   inning            150460 non-null  int64 
 2   batting_team      150460 non-null  object
 3   bowling_team      150460 non-null  object
 4   over              150460 non-null  int64 
 5   ball              150460 non-null  int64 
 6   batsman           150460 non-null  object
 7   non_striker       150460 non-null  object
 8   bowler            150460 non-null  object
 9   is_super_over     150460 non-null  int64 
 10  wide_runs         150460 non-null  int64 
 11  bye_runs          150460 non-null  int64 
 12  legbye_runs       150460 non-null  int64 
 13  noball_runs       150460 non-null  int64 
 14  penalty_runs      150460 non-null  int64 
 15  batsman_runs      150460 non-null  int64 
 16  extra_runs        150460 non-null  int64 
 17  total_runs        150460 non-null  int64 
 18  player_dismissed  7438 non-null    object
 19  dismissal_kind    7438 non-null    object
 20  fielder           5369 non-null    object
dtypes: int64(13), object(8)
memory usage: 24.1+ MB
```

Pre-Processing the Data

Before we start working on our data it is really very important to process the data as it ensures and enhances the performance and is an important step in data mining process.

So, for that we will identify the null values and will remove unnecessary null values from our dataset.

```
In [169]: match_data1.isnull().sum() # to print the sum of null values

Out[169]: id                   0
          season               0
          city                 7
          date                 0
          team1                0
          team2                0
          toss_winner          0
          toss_decision        0
          result               0
          dl_applied           0
          winner               3
          win_by_runs          0
          win_by_wickets       0
          player_of_match      3
          venue                0
          umpire1              1
          umpire2              1
          umpire3            636
          dtype: int64
```

```
In [171]: match_data= match_data1.drop(['umpire3'], axis=1) # dropping table umpire3 as it containse null values

In [172]: match_data

Out[172]:
```

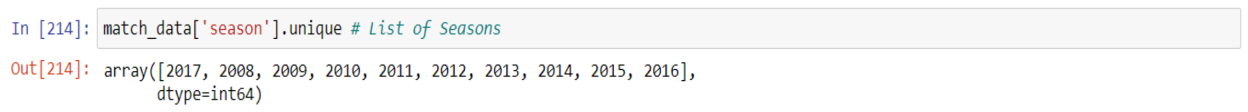
	id	season	city	date	team1	team2	toss_winner	toss_decision	result	dl_applied	winner	win_by_runs	win_by_wickets	player_
0	1	2017	Hyderabad	05-04-2017	Sunrisers Hyderabad	Royal Challengers Bangalore	Royal Challengers Bangalore	field	normal	0	Sunrisers Hyderabad	35	0	Yuv
1	2	2017	Pune	06-04-2017	Mumbai Indians	Rising Pune Supergiant	Rising Pune Supergiant	field	normal	0	Rising Pune Supergiant	0	7	Sl
2	3	2017	Rajkot	07-04-2017	Gujarat Lions	Kolkata Knight Riders	Kolkata Knight Riders	field	normal	0	Kolkata Knight Riders	0	10	
3	4	2017	Indore	08-04-2017	Rising Pune Supergiant	Kings XI Punjab	Kings XI Punjab	field	normal	0	Kings XI Punjab	0	6	G
4	5	2017	Bangalore	08-04-2017	Royal Challengers Bangalore	Delhi Daredevils	Royal Challengers Bangalore	bat	normal	0	Royal Challengers Bangalore	15	0	Kl
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
631	632	2016	Raipur	22-05-2016	Delhi Daredevils	Royal Challengers Bangalore	Royal Challengers Bangalore	field	normal	0	Royal Challengers Bangalore	0	6	
632	633	2016	Bangalore	24-05-2016	Gujarat Lions	Royal Challengers Bangalore	Royal Challengers Bangalore	field	normal	0	Royal Challengers Bangalore	0	4	AB

```
In [213]: ball_data.isnull().sum()

Out[213]: match_id                 0
          inning                   0
          batting_team             0
          bowling_team             0
          over                     0
          ball                     0
          batsman                  0
          non_striker              0
          bowler                   0
          is_super_over            0
          wide_runs                0
          bye_runs                 0
          legbye_runs              0
          noball_runs              0
          penalty_runs             0
          batsman_runs             0
          extra_runs               0
          total_runs               0
          player_dismissed    143022
          dismissal_kind      143022
          fielder             145091
          dtype: int64
```

A. General Analysis of IPL Matches

1. List of Seasons

By using the unique() function on the season column, we can retrieve the dataset's list of seasons, confirming that it contains information about matches played between the seasons of 2008 and 2017.

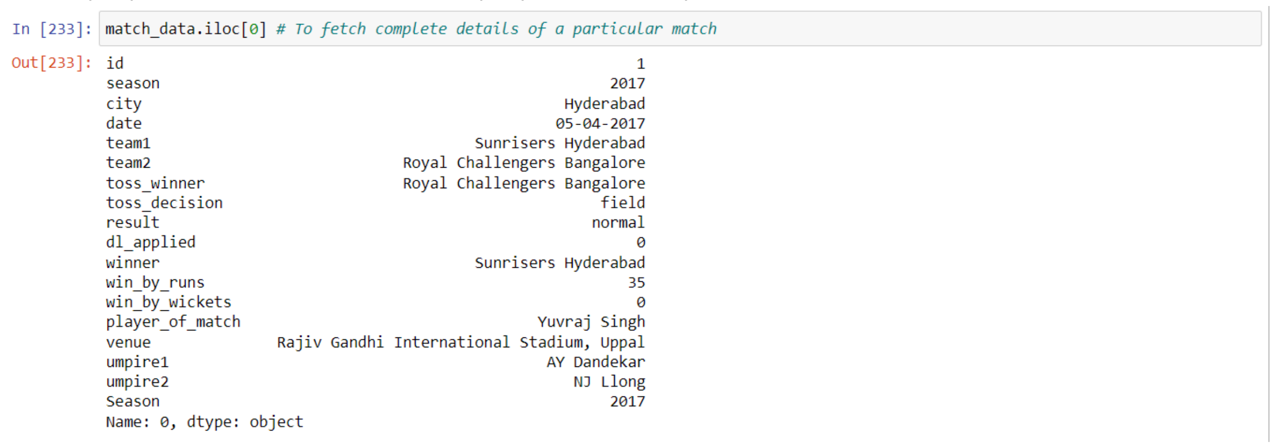


```
In [214]: match_data['season'].unique # List of Seasons

Out[214]: array([2017, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016],
                dtype=int64)
```

2. To fetch complete details of a particular match

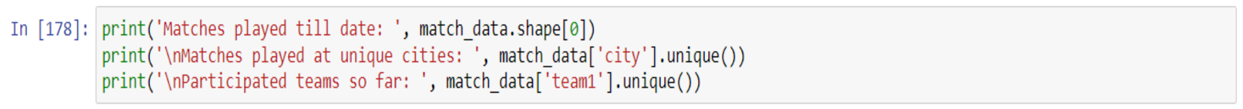
Each data point includes information that is self-explanatory, such as the match_id, season, start_date, venue, innings, ball, batting_team, bowling_team, striker, non_striker, bowler, runs_off_bat, extras, wides, no balls, byes, leg byes, wicket_type, player_dismissed, run

Here I have fetched the first row of the data sets which corresponds to the details of the IPL match played between SRH and RCB played on 5th April, 2017.



```
In [233]: match_data.iloc[0] # To fetch complete details of a particular match

Out[233]: id                                                  1
          season                                           2017
          city                                        Hyderabad
          date                                       05-04-2017
          team1                                 Sunrisers Hyderabad
          team2                          Royal Challengers Bangalore
          toss_winner                    Royal Challengers Bangalore
          toss_decision                                     field
          result                                           normal
          dl_applied                                            0
          winner                                Sunrisers Hyderabad
          win_by_runs                                          35
          win_by_wickets                                        0
          player_of_match                               Yuvraj Singh
          venue              Rajiv Gandhi International Stadium, Uppal
          umpire1                                       AY Dandekar
          umpire2                                          NJ Llong
          Season                                             2017
          Name: 0, dtype: object
```

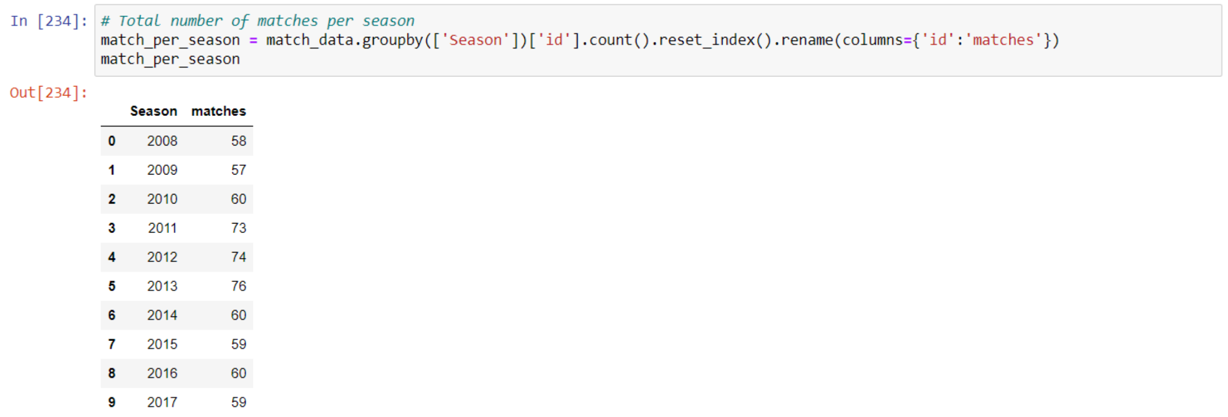
3. Matches played till date; unique cities and participated teams so far



```
In [178]: print('Matches played till date: ', match_data.shape[0])
          print('\nMatches played at unique cities: ', match_data['city'].unique())
          print('\nParticipated teams so far: ', match_data['team1'].unique())
```

4. Season wise IPL matches

By grouping the match id and season columns, counting the data, and then calling the index out of it by removing the match id from the first index layer, I have determined how many matches were played in each season.

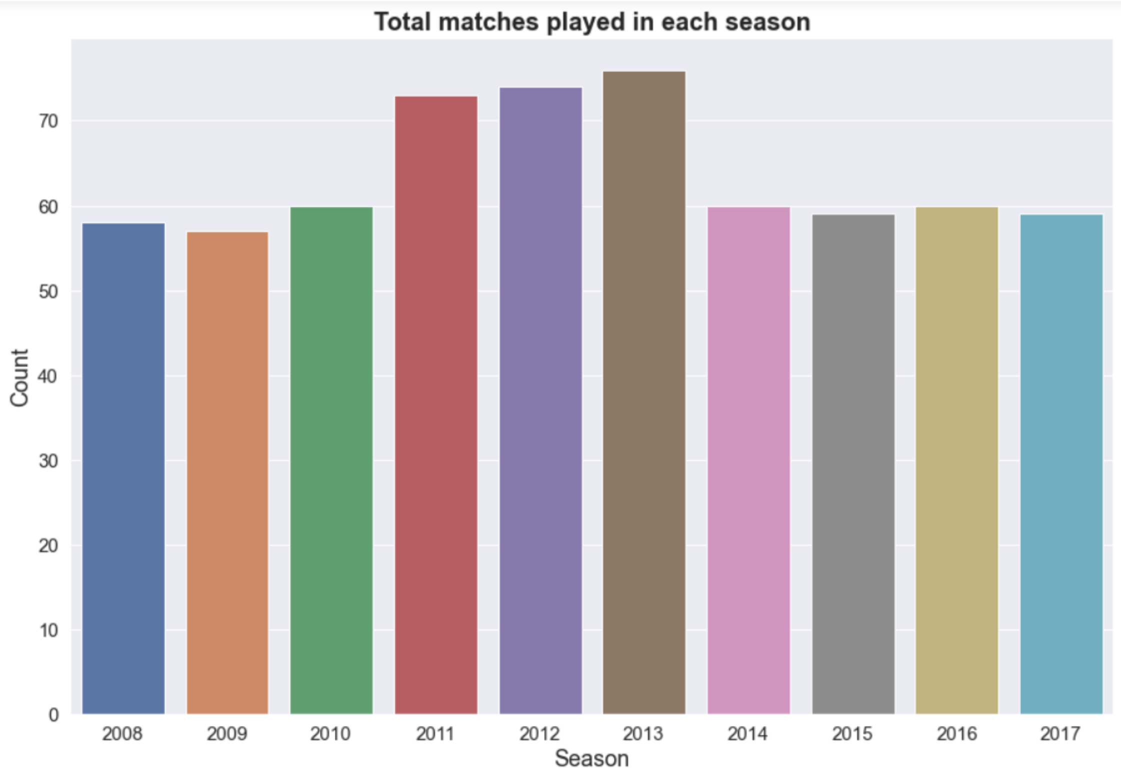


```
In [234]: # Total number of matches per season
          match_per_season = match_data.groupby(['Season'])['id'].count().reset_index().rename(columns={'id':'matches'})
          match_per_season

Out[234]:
```

	Season	matches
0	2008	58
1	2009	57
2	2010	60
3	2011	73
4	2012	74
5	2013	76
6	2014	60
7	2015	59
8	2016	60
9	2017	59

We can see the visualization of the IPL matches using the Matlotlib library.

```
In [239]: # Visualization for Total number of matches per season
          sns.countplot(match_data['Season'])
          plt.xticks(fontsize=15)
          plt.yticks(fontsize=15)
          plt.xlabel('Season', fontsize=18)
          plt.ylabel('Count', fontsize=18)
          plt.title('Total matches played in each season', fontsize = 20, fontweight = "bold")

          D:\Cdrive\Users\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword
          arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit k
          eyword will result in an error or misinterpretation.
            warnings.warn(

Out[239]: Text(0.5, 1.0, 'Total matches played in each season')
```



5. Most IPL matches played in a Venue

The analysis shows most of the IPL matches were played in Bangalore, Kolkata, Delhi, Mumbai.

```
In [241]: # Most IPL Matches played in a Venue
          match_data.groupby(['venue','id']).count().droplevel(level=1).index.value_counts()

Out[241]: M Chinnaswamy Stadium                                   66
          Eden Gardens                                            61
          Feroz Shah Kotla                                        60
          Wankhede Stadium                                        57
          Rajiv Gandhi International Stadium, Uppal               49
          MA Chidambaram Stadium, Chepauk                         48
          Punjab Cricket Association Stadium, Mohali              35
          Sawai Mansingh Stadium                                  33
          Dr DY Patil Sports Academy                              17
          Subrata Roy Sahara Stadium                              17
          Kingsmead                                               15
          Maharashtra Cricket Association Stadium                 15
          Sardar Patel Stadium, Motera                            12
          SuperSport Park                                         12
          Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket Stadium     11
          Brabourne Stadium                                       11
          Punjab Cricket Association IS Bindra Stadium, Mohali    11
          Saurashtra Cricket Association Stadium                  10
          Himachal Pradesh Cricket Association Stadium             9
          New Wanderers Stadium                                    8
          St George's Park                                         7
          Sheikh Zayed Stadium                                     7
          Barabati Stadium                                         7
          Newlands                                                 7
          JSCA International Stadium Complex                       7
          Dubai International Cricket Stadium                      7
          Shaheed Veer Narayan Singh International Stadium         6
          Sharjah Cricket Stadium                                  6
          Holkar Cricket Stadium                                   5
          Nehru Stadium                                            5
          Green Park                                               4
          De Beers Diamond Oval                                    3
          Buffalo Park                                             3
          Vidarbha Cricket Association Stadium, Jamtha             3
```

B. IPL Batting Analysis

6. Most Run Scored by IPL Teams

I have classified teams by batting_team and added up their total_runs scored over all seasons to see which team has scored the most runs overall. Then arrange them in descending order.

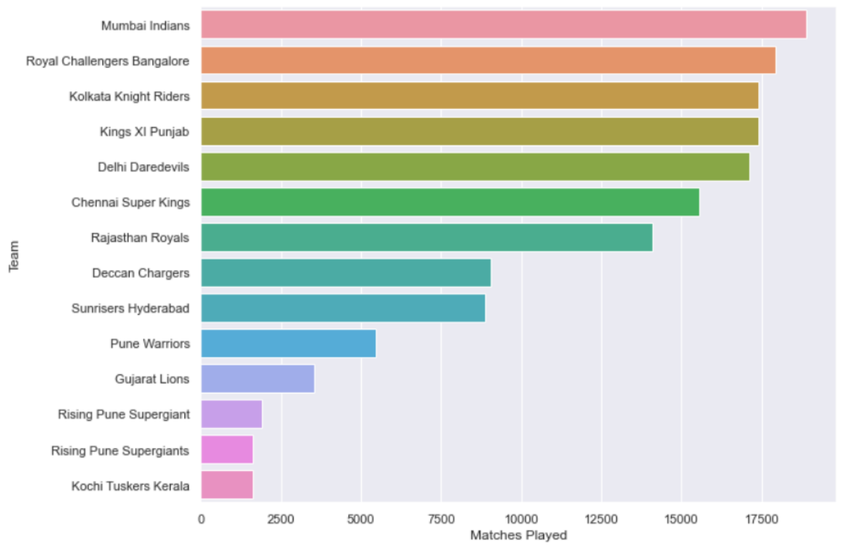
Without any surprise, MI is at the top of the list.

```
In [250]: # Most Run Scored by IPL Teams
          season_data.groupby(['batting_team'])['total_runs'].sum().sort_values(ascending=False)

Out[250]: batting_team
          Mumbai Indians                 24521
          Royal Challengers Bangalore    23436
          Kings XI Punjab                23068
          Kolkata Knight Riders          21965
          Delhi Daredevils               21953
          Chennai Super Kings            20899
          Rajasthan Royals               17703
          Sunrisers Hyderabad            11652
          Deccan Chargers                11463
          Pune Warriors                   6358
          Gujarat Lions                   4862
          Rising Pune Supergiant          2470
          Rising Pune Supergiants         2063
          Kochi Tuskers Kerala            1901
          Name: total_runs, dtype: int64
```

7. IPL Matches Played by Each Team

We can find out how many matches each team has played by grouping the batting team and match id columns, counting the data, and then dropping the first index layer which is match_id.

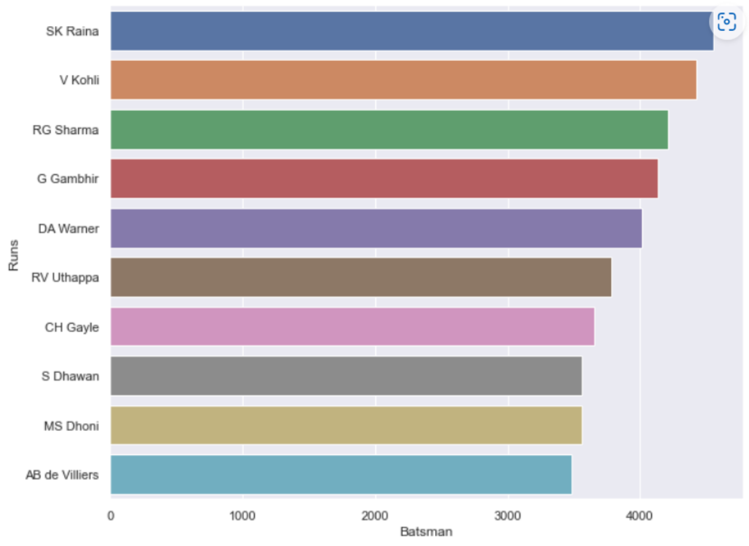
```
In [253]: # IPL Matches Played by Each Team
          plt.figure(figsize=(10,8))
          data = season_data['bowling_team'].value_counts().sort_values(ascending=False)
          sns.barplot(y=data.index,x=data,orient='h')
          plt.xlabel('Matches Played')
          plt.ylabel('Team')
          plt.show()
```



8. Most IPL Runs by a Batsman

Mr. IPL, Suresh Raina, is at the top of this list with over 4,500 runs, followed by Virat Kohli and RG Sharma.

```
In [256]: # Most IPL Runs by a Batsman
          plt.figure(figsize=(10,8))
          data = season_data.groupby(['batsman'])['batsman_runs'].sum().sort_values(ascending=False)[:10]
          sns.barplot(y=data.index,x=data,orient='h')
          plt.xlabel('Batsman')
          plt.ylabel('Runs')
          plt.show()
```

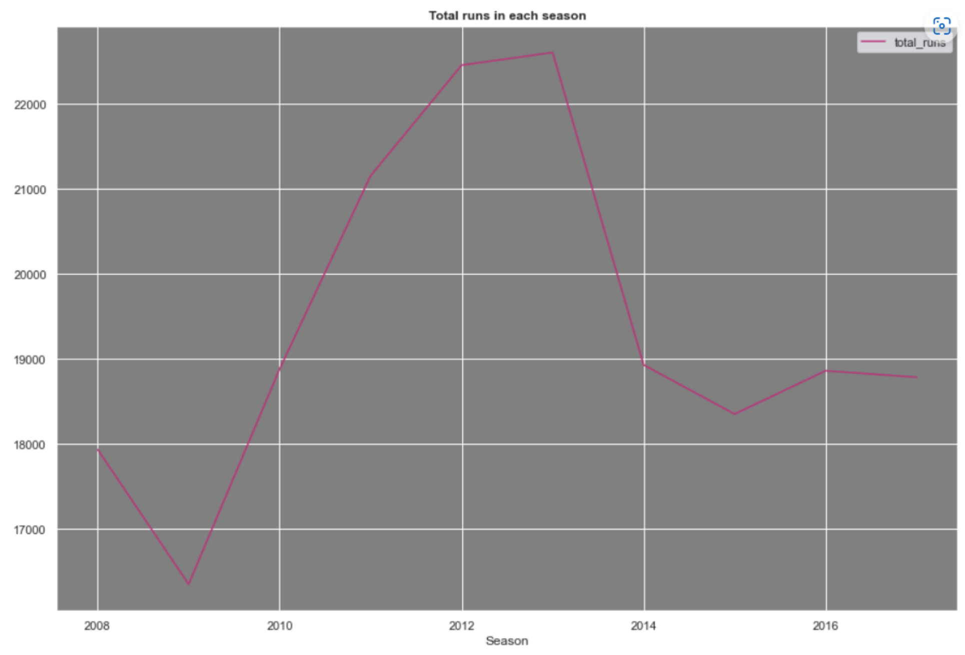


9. Total number of runs scored in each season

2013 Season had the greatest number of runs scored in IPL history.

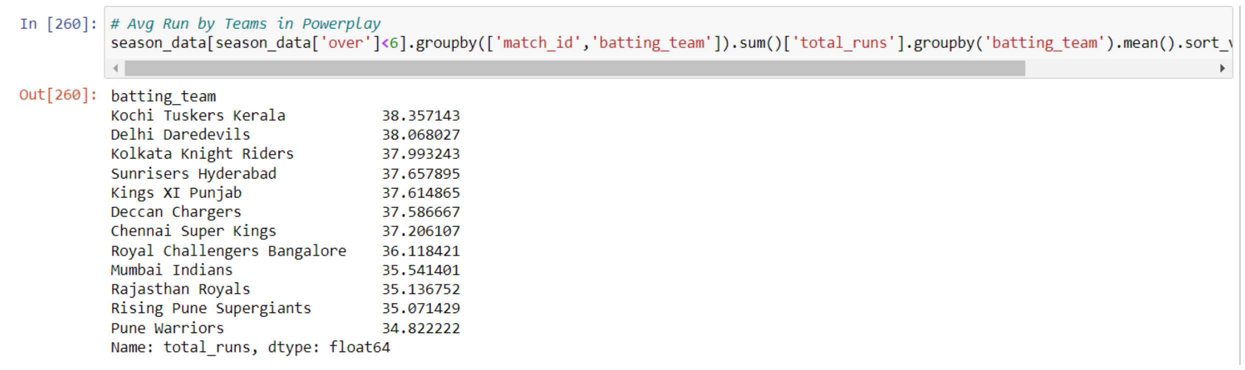
```
In [254]: # Visualization for total number of runs scored in each season
          season=season_data.groupby(['Season'])['total_runs'].sum().reset_index()
          p=season.set_index('Season')
          ax=plt.axes()
          ax.set(facecolor = "grey")
          sns.lineplot(data=p,palette="magma")
          plt.title('Total runs in each season', fontsize=12, fontweight="bold")
          plt.show()
```

```
plt.show()
```



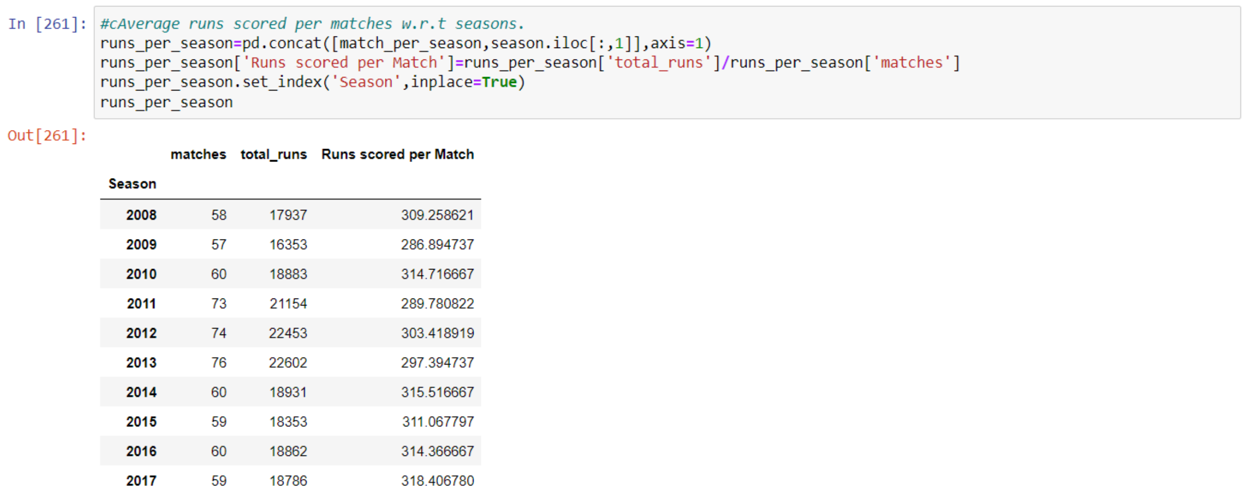
10. Average runs by teams in powerplay

Team Kochi Tuskers Kerala leads the powerplay average with 38.3 runs per game, followed by Delhi Daredevils and KKR.



```
In [260]: # Avg Run by Teams in Powerplay
          season_data[season_data['over']<6].groupby(['match_id','batting_team']).sum()['total_runs'].groupby('batting_team').mean().sort_

Out[260]: batting_team
          Kochi Tuskers Kerala           38.357143
          Delhi Daredevils               38.068027
          Kolkata Knight Riders          37.993243
          Sunrisers Hyderabad            37.657895
          Kings XI Punjab                37.614865
          Deccan Chargers                37.586667
          Chennai Super Kings            37.206107
          Royal Challengers Bangalore    36.118421
          Mumbai Indians                 35.541401
          Rajasthan Royals               35.136752
          Rising Pune Supergiants        35.071429
          Pune Warriors                  34.822222
          Name: total_runs, dtype: float64
```

11. Average runs scored per matches w.r.t seasons



```
In [261]: #cAverage runs scored per matches w.r.t seasons.
          runs_per_season=pd.concat([match_per_season,season.iloc[:,1]],axis=1)
          runs_per_season['Runs scored per Match']=runs_per_season['total_runs']/runs_per_season['matches']
          runs_per_season.set_index('Season',inplace=True)
          runs_per_season

Out[261]:
```

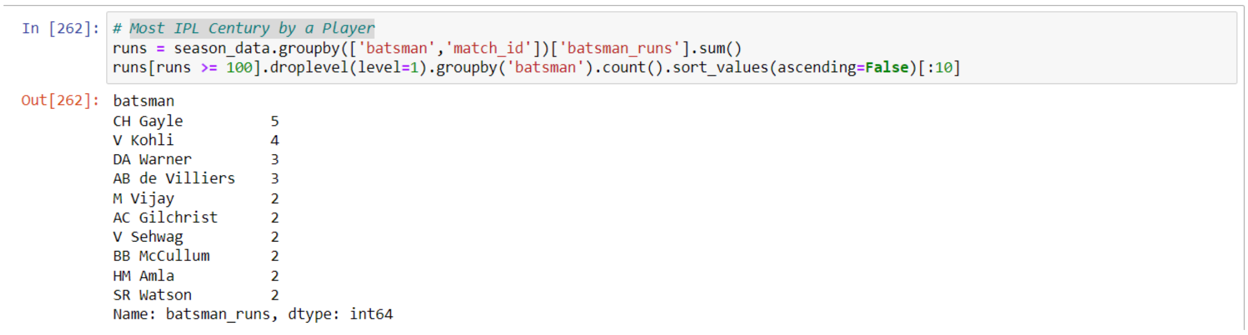
	matches	total_runs	Runs scored per Match
Season			
2008	58	17937	309.258621
2009	57	16353	286.894737
2010	60	18883	314.716667
2011	73	21154	289.780822
2012	74	22453	303.418919
2013	76	22602	297.394737
2014	60	18931	315.516667
2015	59	18353	311.067797
2016	60	18862	314.366667
2017	59	18786	318.406780

12. Most IPL century by a player

Chris Gayle, the Universe Boss, holds the record for the most centuries scored in IPL history. In the IPL, he has five tons and 4700 runs.

Former teammate Virat Kohli is second on the list with four hundreds, followed by David Warner, AB de Villiers, Murali Vijay, and Adam Gilchrist.

This can be calculated by adding the columns striker and match id together and then summing them.

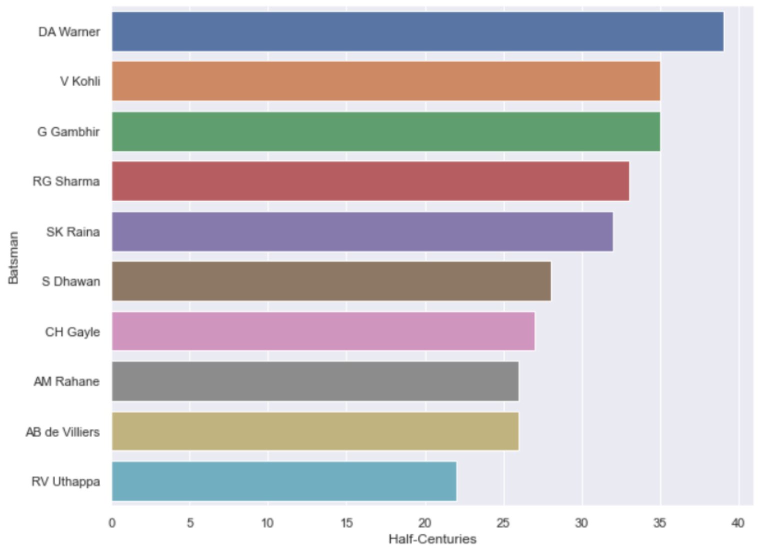


```
In [262]: # Most IPL Century by a Player
          runs = season_data.groupby(['batsman','match_id'])['batsman_runs'].sum()
          runs[runs >= 100].droplevel(level=1).groupby('batsman').count().sort_values(ascending=False)[:10]

Out[262]: batsman
          CH Gayle        5
          V Kohli         4
          DA Warner       3
          AB de Villiers  3
          M Vijay         2
          AC Gilchrist    2
          V Sehwag        2
          BB McCullum     2
          HM Amla         2
          SR Watson       2
          Name: batsman_runs, dtype: int64
```

13. Most IPL fifty by a player

When it comes to fifties, Warner is first, followed by Virat Kohli and Shikhar Dhawan. This will be calculated using the same method as before, and I have included a bar graph visualisation for clarity.

```
In [268]: # Most IPL Fifties by a Player
plt.figure(figsize=(10,8))
runs = season_data.groupby(['batsman','match_id'])['batsman_runs'].sum()
data = runs[runs >= 50].droplevel(level=1).groupby('batsman').count().sort_values(ascending=False)[:10]
sns.barplot(y=data.index,x=data,orient='h')
plt.xlabel('Half-Centuries')
plt.ylabel('Batsman')
plt.show()
```



14. Each Season's Orange Cap Holder

The batsman who scored the most runs during the season would wear the Orange Cap while fielding, with the overall leading run-scorer at the end of the tournament receiving the actual Orange Cap award on the day of the season's final.

Shaun Marsh was the first recipient of the award in 2008, and the full list is presented below from the dataset.

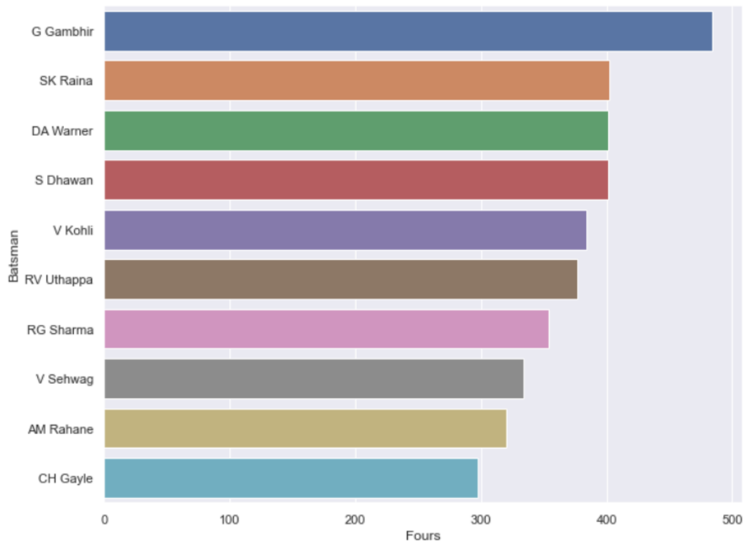
```
In [272]: # Each Season's Orange Cap Holder
data = season_data.groupby(['Season','batsman'])['batsman_runs'].sum().groupby('Season').max()
temp_df=pd.DataFrame(season_data.groupby(['Season','batsman'])['batsman_runs'].sum())
print("{0:10}{1:20}{2:30}".format("Season","Player","Runs"))
for season,run in data.items():
    player = temp_df.loc[season][temp_df.loc[season]['batsman_runs'] == run].index[0]
    print(season,'\t ',player,'\t\t',run)
```

```
Season    Player              Runs
2008      SE Marsh               616
2009      ML Hayden              572
2010      SR Tendulkar           618
2011      CH Gayle               608
2012      CH Gayle               733
2013      MEK Hussey             733
2014      RV Uthappa             660
2015      DA Warner              562
2016      V Kohli                973
2017      DA Warner              641
```

15. A Batsman has the most boundary hits (4s)

Gautam Gambhir, the Indian cricket team's second wall, leads the list with nearly 500 boundaries, followed by Suresh Raina and David Warner.

```
In [273]: # A Batsman has the most boundary hits (4s).
          plt.figure(figsize=(10,8))
          data = season_data[season_data['batsman_runs'] == 4]['batsman'].value_counts()[:10]
          sns.barplot(y=data.index,x=data,orient='h')
          plt.xlabel('Fours')
          plt.ylabel('Batsman')
          plt.show()
```



16. The most sixes by a player in an IPL inning

Chris Gayle has hit the most sixes in an inning in IPL history, with 17 in a single inning. Brendon McCullum and AB De Villiers came next.

```
In [275]: # Most Sixes by a player in an IPL Inning
          season_data[season_data['batsman_runs'] == 6].groupby(['match_id','batsman']).count()['Season'].sort_values(ascending=False).drop

Out[275]: batsman
          CH Gayle         17
          BB McCullum      13
          CH Gayle         13
          CH Gayle         12
          AB de Villiers   12
          ST Jayasuriya    11
          M Vijay          11
          AC Gilchrist     10
          CH Gayle          9
          CH Gayle          9
          Name: Season, dtype: int64
```

17. Player with the most runs in an IPL season

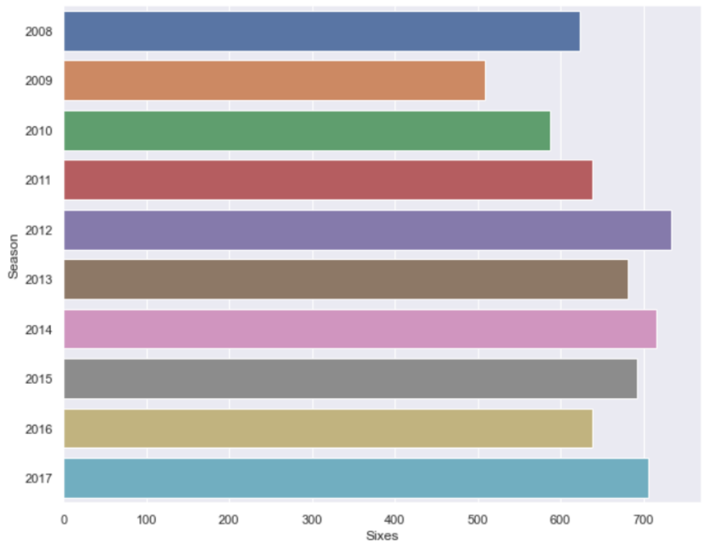
Virat Kohli leads the list with 973 runs in the 2016 season, followed by David Warner and Michael Hussey with 848 and 733 runs in the 2016 and 2013 seasons, respectively.

```
In [276]: # Player with the most runs in an IPL season
          season_data.groupby(['batsman','Season'])['batsman_runs'].sum().sort_values(ascending=False)[:10]

Out[276]: batsman          Season
          V Kohli          2016      973
          DA Warner        2016      848
          MEK Hussey       2013      733
          CH Gayle         2012      733
                           2013      720
          AB de Villiers   2016      687
          RV Uthappa       2014      660
          DA Warner        2017      641
          V Kohli          2013      639
          SR Tendulkar     2010      618
          Name: batsman_runs, dtype: int64
```

18. Number of sixes in IPL seasons

The season with the most sixes hit is 2012. Seasons 2014 and 2017 are next in the list of seasons with the most sixes.

```
In [277]: # No. of sixes in IPL seasons
          plt.figure(figsize=(10,8))
          data = season_data[season_data['batsman_runs'] == 6].groupby('Season').count()['match_id'].sort_values(ascending=False)
          sns.barplot(y=data.index,x=data,orient='h')
          plt.xlabel('Sixes')
          plt.ylabel('Season')
          plt.show()
```



19. IPL Teams' Highest Total

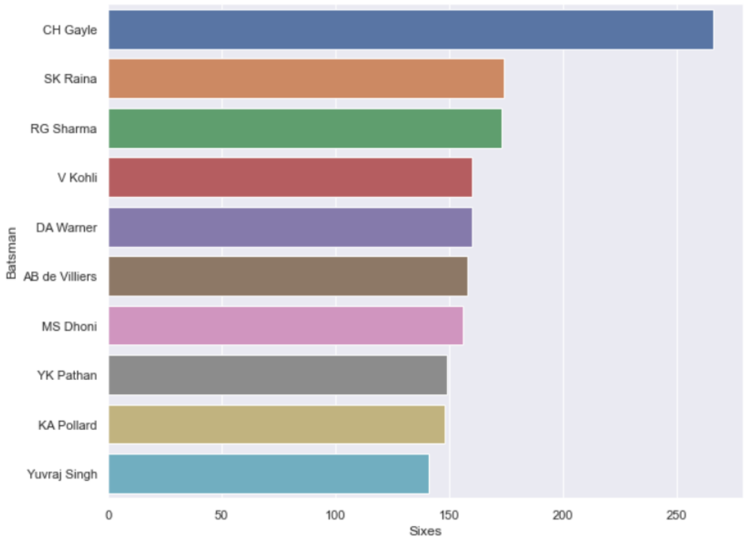
Royal Challengers Bangalore leads the list of the most successful teams. In the 2019 season, the match was played against Pune Warrior.

```
In [278]: # IPL Teams' Highest Total
          season_data.groupby(['match_id','batting_team']).sum()['total_runs'].droplevel(level=0).sort_values(ascending=False)[:10]

Out[278]: batting_team
          Royal Challengers Bangalore    263
          Royal Challengers Bangalore    248
          Chennai Super Kings            246
          Chennai Super Kings            240
          Royal Challengers Bangalore    235
          Kings XI Punjab                232
          Kings XI Punjab                231
          Delhi Daredevils               231
          Kings XI Punjab                230
          Royal Challengers Bangalore    227
          Name: total_runs, dtype: int64
```

20. Most IPL Sixes Hit by a batsman

The list of cricketers who have hit the most sixes have The Universe Boss, Chris Gayle at the top, followed by Suresh Raina and RG Sharma.

```
In [283]: # Most IPL Sixes Hit by a batsman
          plt.figure(figsize=(10,8))
          data = season_data[season_data['batsman_runs'] == 6]['batsman'].value_counts()[:10]
          sns.barplot(y=data.index,x=data,orient='h')
          plt.xlabel('Sixes')
          plt.ylabel('Batsman')
          plt.show()
```



21. Highest IPL score for an individual

The 2013 season's highest individual score was made by Chris Gayle while he was playing against the Pune Warrior. The second and third names on the list are Brendon McCullum and Ab de Villiers.

```
In [294]: # Highest IPL score for an individual
          season_data.groupby(['batsman','match_id'])['batsman_runs'].sum().sort_values(ascending=False)[:10]

Out[294]: batsman         match_id
          CH Gayle        411         175
          BB McCullum     60          158
          AB de Villiers  562         133
                          620         129
          CH Gayle        372         128
          M Vijay         206         127
          DA Warner       36          126
          V Sehwag        516         122
          PC Valthaty     243         120
          V Sehwag        279         119
          Name: batsman_runs, dtype: int64
```

C. IPL Bowling Statistics

22. Most runs a bowler has conceded in an inning

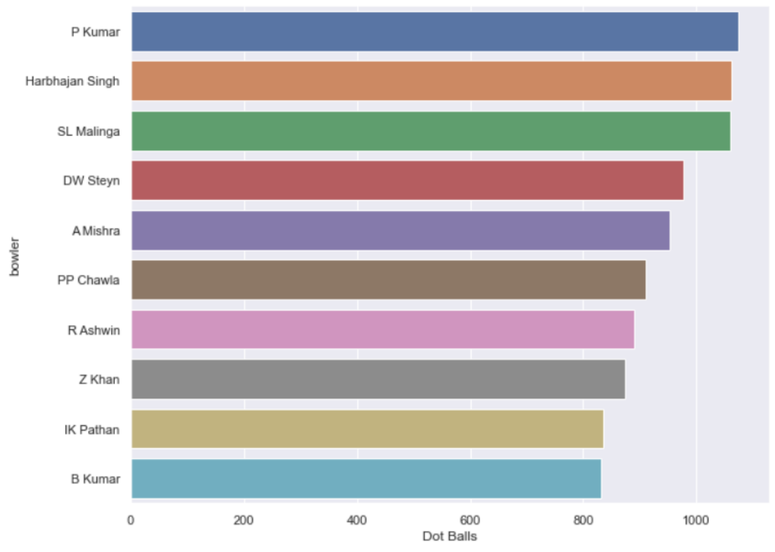
Ishant Sharma is at the top of the list with 66 runs conceded, followed by Sandeep Sharma and Umesh Yadav.

```
In [295]: # Most run conceded by a bowler in an inning
          season_data.groupby(['bowler','match_id'])['total_runs'].sum().droplevel(level=1).sort_values(ascending=False)[:10]

Out[295]: bowler
          I Sharma          66
          Sandeep Sharma    66
          UT Yadav          65
          PJ Cummins        65
          AB Dinda          63
          VR Aaron          63
          MG Neser          62
          SR Watson         61
          R McLaren         61
          P Awana           60
          Name: total_runs, dtype: int64
```

23. Bowler with the most dot balls

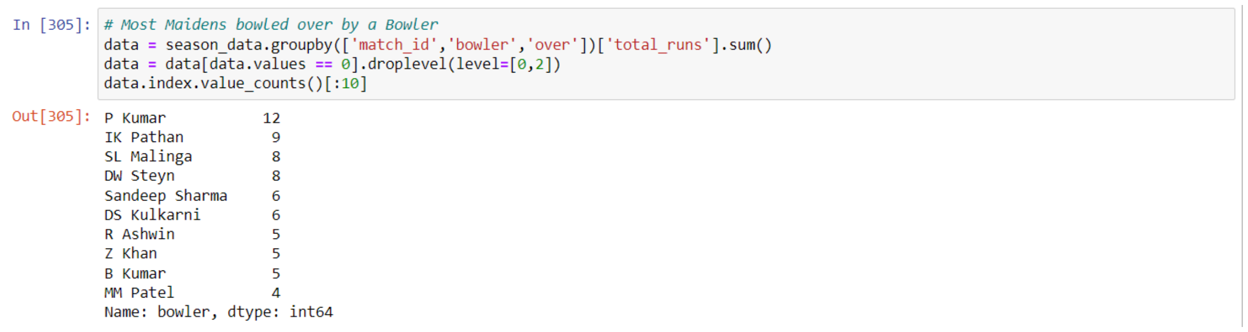
The most dot balls have been delivered by Indian bowler Praveen Kumar, followed by Harbhajan Singh, Lasith Malinga, and Dwayne Steyn.

```
In [304]: # Bowler with the most dot balls
          plt.figure(figsize=(10,8))
          data = season_data[season_data['total_runs'] == 0].groupby('bowler').count()['match_id'].sort_values(ascending=False)[:10]
          sns.barplot(y=data.index,x=data,orient='h')
          plt.xlabel('Dot Balls')
          plt.ylabel('bowler')
          plt.show()
```



24. Most Maidens bowled over by a Bowler

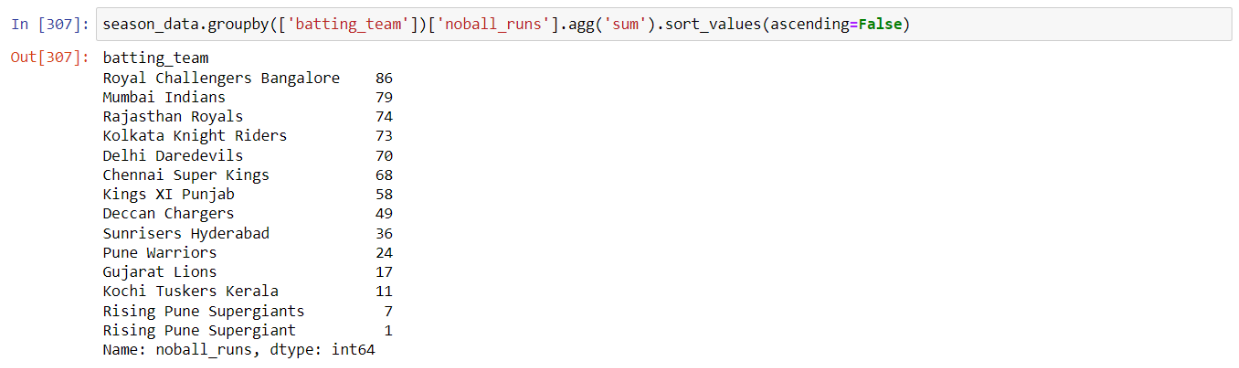
Praveen Kumar, an Indian right-hand medium-pacer bowler, leads the list with the most maiden overs, followed by Irfan Pathan and Lasith Malinga.



```
In [305]: # Most Maidens bowled over by a Bowler
          data = season_data.groupby(['match_id','bowler','over'])['total_runs'].sum()
          data = data[data.values == 0].droplevel(level=[0,2])
          data.index.value_counts()[:10]

Out[305]: P Kumar           12
          IK Pathan          9
          SL Malinga         8
          DW Steyn           8
          Sandeep Sharma     6
          DS Kulkarni        6
          R Ashwin           5
          Z Khan             5
          B Kumar            5
          MM Patel           4
          Name: bowler, dtype: int64
```

25. IPL team with the most no-balls

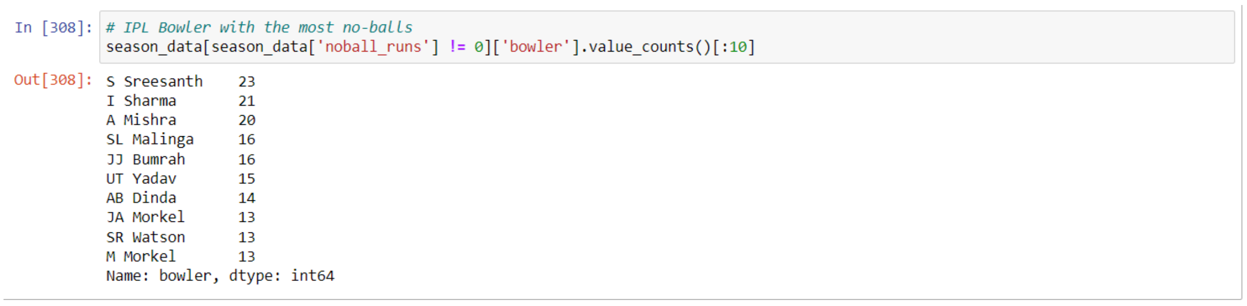
The most no balls have been given by Royal Challengers Bangalore, followed by Mumbai Indians and Rajasthan Royals.



```
In [307]: season_data.groupby(['batting_team'])['noball_runs'].agg('sum').sort_values(ascending=False)

Out[307]: batting_team
          Royal Challengers Bangalore    86
          Mumbai Indians                 79
          Rajasthan Royals               74
          Kolkata Knight Riders          73
          Delhi Daredevils               70
          Chennai Super Kings            68
          Kings XI Punjab                58
          Deccan Chargers                49
          Sunrisers Hyderabad            36
          Pune Warriors                  24
          Gujarat Lions                  17
          Kochi Tuskers Kerala           11
          Rising Pune Supergiants         7
          Rising Pune Supergiant          1
          Name: noball_runs, dtype: int64
```

26. IPL Bowler with the most no-balls

S Sreesanth, an Indian bowler, has bowled the most no balls, followed by Ishant Sharma and Amit Mishra.

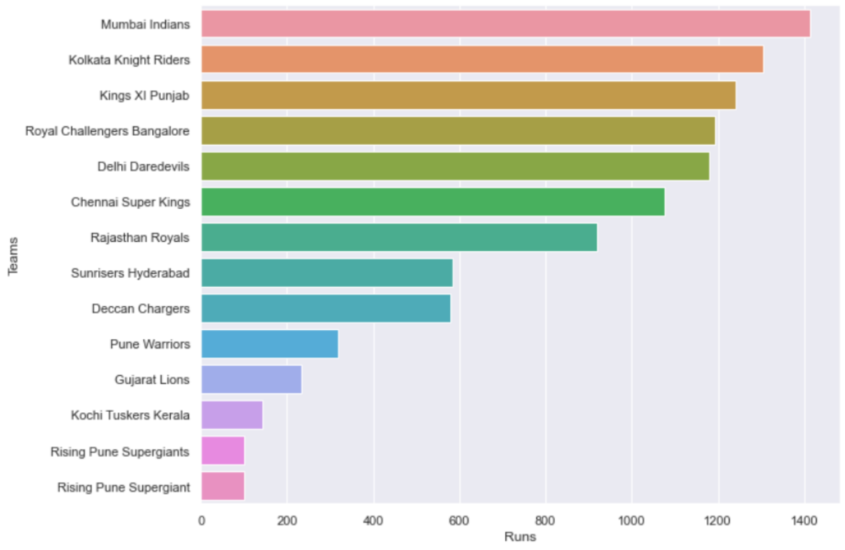


```
In [308]: # IPL Bowler with the most no-balls
          season_data[season_data['noball_runs'] != 0]['bowler'].value_counts()[:10]

Out[308]: S Sreesanth     23
          I Sharma        21
          A Mishra        20
          SL Malinga      16
          JJ Bumrah       16
          UT Yadav        15
          AB Dinda        14
          JA Morkel       13
          SR Watson       13
          M Morkel        13
          Name: bowler, dtype: int64
```

27. Most runs in Extras given by a team

The most extras (byes, no balls, wides) were given by Mumbai Indians, followed by Kolkata Knight Riders and Kings XI Punjab.

```
In [309]: # Most runs in Extras given by a team.
          plt.figure(figsize=(10,8))
          data = season_data.groupby(['batting_team'])['extra_runs'].agg('sum').sort_values(ascending=False)
          sns.barplot(y=data.index,x=data,orient='h')
          plt.xlabel('Runs')
          plt.ylabel('Teams')
          plt.show()
```



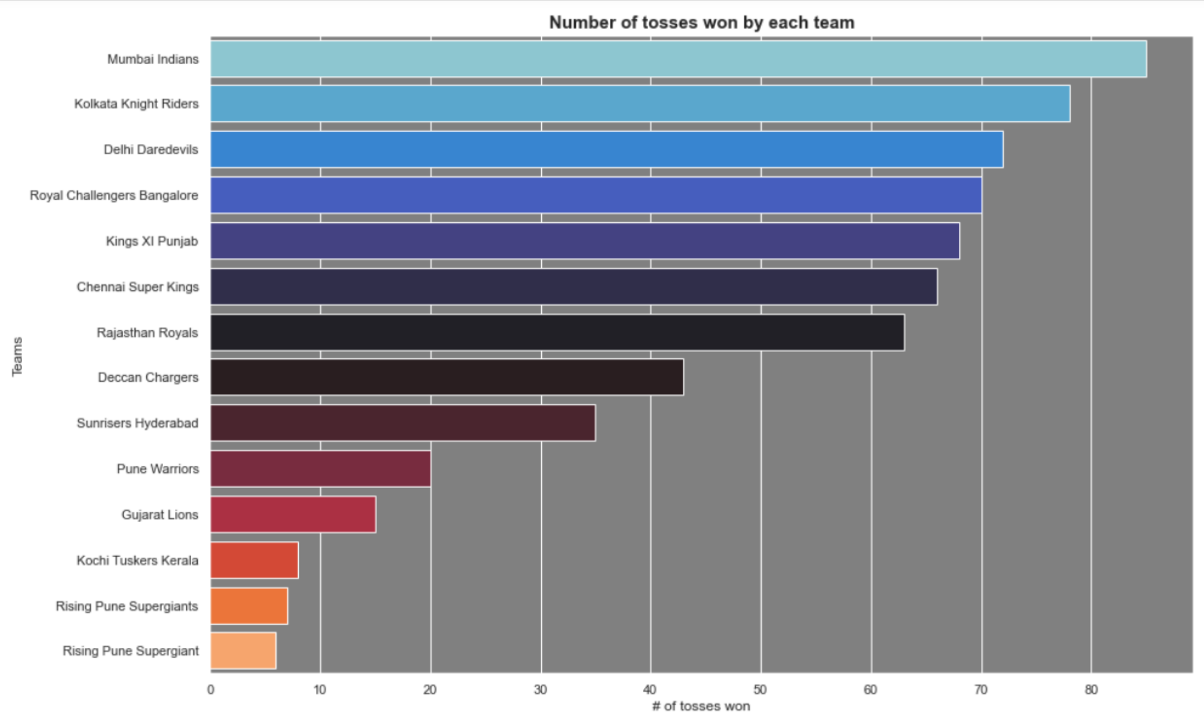
D. IPL Toss Analytics

28. Tosses won by each team

The most successful team of IPL which is Mumbai Indians have won most number of tosses.

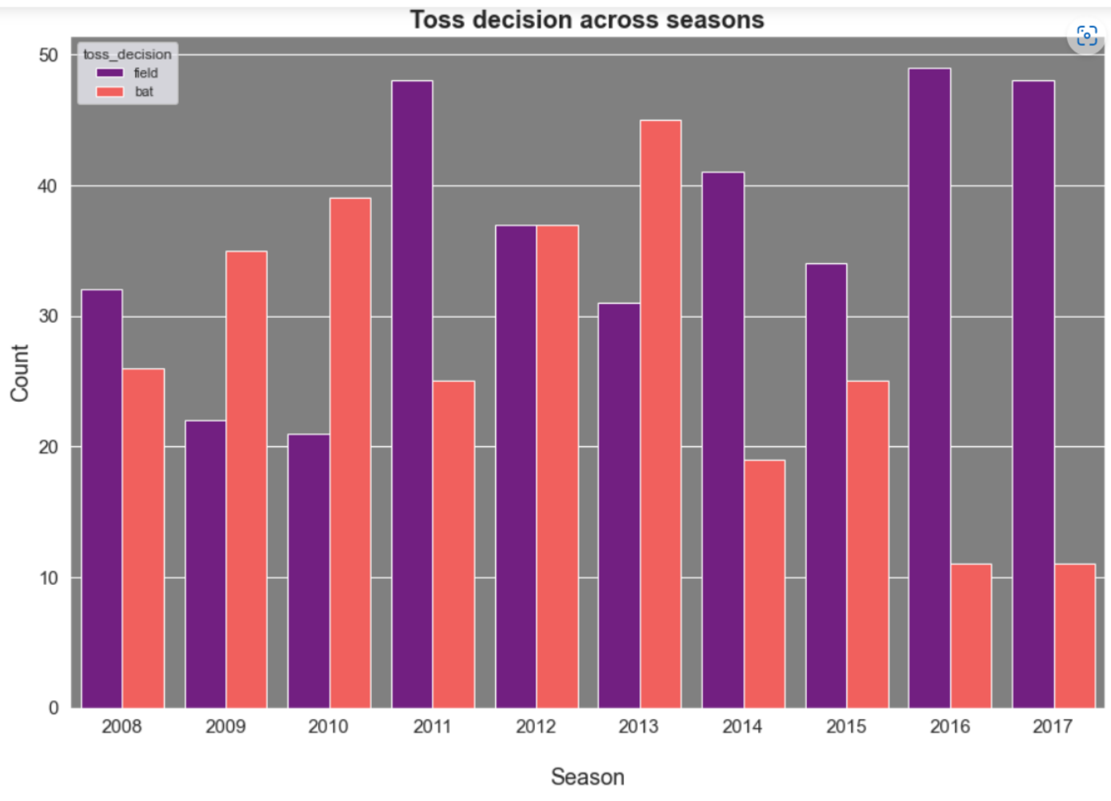
```
In [312]: # Tosses won by each team
          match_data['toss_winner'].value_counts()

Out[312]: Mumbai Indians                 85
          Kolkata Knight Riders          78
          Delhi Daredevils               72
          Royal Challengers Bangalore    70
          Kings XI Punjab                68
          Chennai Super Kings            66
          Rajasthan Royals               63
          Deccan Chargers                43
          Sunrisers Hyderabad            35
          Pune Warriors                  20
          Gujarat Lions                  15
          Kochi Tuskers Kerala            8
          Rising Pune Supergiants         7
          Rising Pune Supergiant          6
          Name: toss_winner, dtype: int64
```

```
In [313]: # Visualization for tosses won by each team
          toss=match_data['toss_winner'].value_counts()
          ax = plt.axes()
          ax.set(facecolor = "grey")
          sns.set(rc={'figure.figsize':(15,10)},style='darkgrid')
          ax.set_title('Number of tosses won by each team',fontsize=15,fontweight="bold")
          sns.barplot(y=toss.index, x=toss, orient='h', palette="icefire", saturation=1)
          plt.xlabel('# of tosses won')
          plt.ylabel('Teams')
          plt.show()
```



29. Tosses decision throughout the season

```
In [187]: # Descision made by the toss winning teams throught the seasons
          ax = plt.axes()
          ax.set(facecolor = "grey")
          sns.countplot(x='Season', hue='toss_decision', data=match_data, palette="magma", saturation=1)
          plt.xticks(fontsize=15)
          plt.yticks(fontsize=15)
          plt.xlabel('\nSeason', fontsize=18)
          plt.ylabel('Count', fontsize=18)
          plt.title('Toss decision across seasons', fontsize=20, fontweight="bold")
          plt.show()
```



E. Advanced analytics

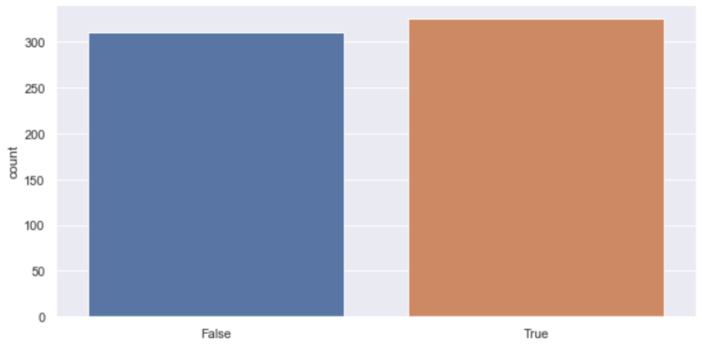
30. Interesting Facts

```
In [314]: # Match Results
          match_data['result'].value_counts()

Out[314]: normal       626
          tie            7
          no result      3
          Name: result, dtype: int64

In [315]: # stadium with most runs scored
          match_data.venue[match_data.result!='runs'].mode()

Out[315]: 0    M Chinnaswamy Stadium
          Name: venue, dtype: object

In [316]: # stadium with most wickets taken
          match_data.venue[match_data.result!='wickets'].mode()

Out[316]: 0    M Chinnaswamy Stadium
          Name: venue, dtype: object

In [317]: # For any given IPL team, which stadium is best when they win the toss?
          match_data.venue[match_data.toss_winner=='Chennai Super Kings'][match_data.winner=='Chennai Super Kings'].mode()

Out[317]: 0    MA Chidambaram Stadium, Chepauk
          Name: venue, dtype: object

In [318]: # Which is the team that has won maximum number of matches batting second?
          match_data.winner[match_data.result!='runs'].mode()

Out[318]: 0    Mumbai Indians
          Name: winner, dtype: object


In [319]: # Which is the team that has won maximum number of matches batting first?
          match_data.winner[match_data.result!='wickets'].mode()

Out[319]: 0    Mumbai Indians
          Name: winner, dtype: object
```

31. Winning the toss means winning the match?

To some extent it is believed to be true as our data gives us the proof.

```
In [320]: # Does winning the toss mean winning the match?
          toss = match_data['toss_winner'] == match_data['winner']
          plt.figure(figsize=(10,5))
          sns.countplot(toss)
          plt.show()

          D:\Cdrive\Users\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword
          arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit k
          eyword will result in an error or misinterpretation.
            warnings.warn(
```

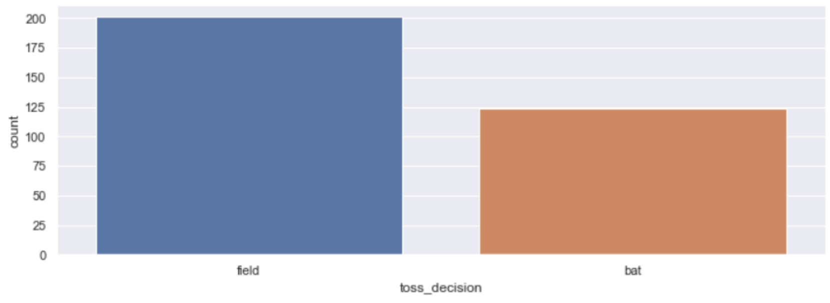


32. Choosing batting or bowling first helps in winning matches?

Its fielding that helped the teams most to win their matches in the past seasons.

In [321]:
```
# Does choosing batting or bowling first help in winning matches?
plt.figure(figsize=(12,4))
sns.countplot(match_data.toss_decision[match_data.toss_winner == match_data.winner])
plt.show()

# This shows that, choosing to field first after winning the toss first creates a higher chances to win the match.
```

```
D:\Cdrive\Users\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword
arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit k
eyword will result in an error or misinterpretation.
  warnings.warn(
```



33. Analyse the performance of a player throughout the IPL

Here, I tried to analyse the performance of Suresh Raina

In [322]:
```
# Analyse the performance of a player throughout the IPL
player = (ball_data['batsman']=='SK Raina')
df_raina=ball_data[player]
df_raina.head()
```

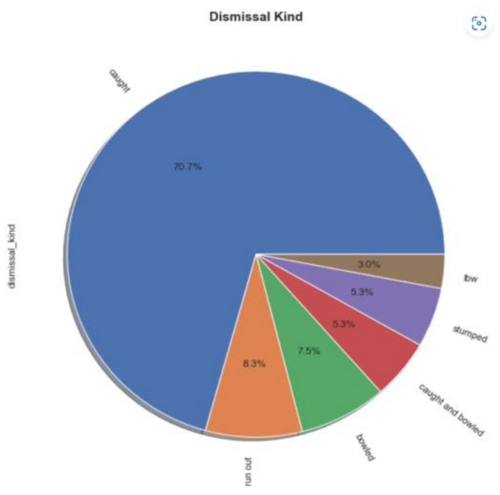
Out[322]:

	match_id	inning	batting_team	bowling_team	over	ball	batsman	non_striker	bowler	is_super_over	...	bye_runs	legbye_runs	noball_runs	penalty_r
515	3	1	Gujarat Lions	Kolkata Knight Riders	4	2	SK Raina	BB McCullum	PP Chawla	0	...	0	0	0	
516	3	1	Gujarat Lions	Kolkata Knight Riders	4	3	SK Raina	BB McCullum	PP Chawla	0	...	0	0	0	
520	3	1	Gujarat Lions	Kolkata Knight Riders	5	1	SK Raina	BB McCullum	SP Narine	0	...	0	0	0	
526	3	1	Gujarat Lions	Kolkata Knight Riders	6	1	SK Raina	BB McCullum	CR Woakes	0	...	0	0	0	
527	3	1	Gujarat Lions	Kolkata Knight Riders	6	2	SK Raina	BB McCullum	CR Woakes	0	...	0	0	0	

5 rows × 21 columns

34. How a particular player is dismissed throughout the IPL in all the seasons

In [323]:
```
# How a particular player is dismissed throughout the IPL in all the seasons
df_raina["dismissal_kind"].value_counts().plot.pie(autopct='%1.1f%%',shadow=True, rotatelabels=True)
plt.title("Dismissal Kind", fontweight="bold",fontsize=15)
plt.show()
```



35. Players scoring stats

```
In [324]: # Players scoring stats
          def count(df_raina,runs):
              return len(df_raina[df_raina['batsman_runs']==runs])*runs
```

```
In [325]: print("Runs scored from single(s) : ", count(df_raina,1))
          print("Runs scored from double(s) : ", count(df_raina,2))
          print("Runs scored from 3'(s) : ", count(df_raina,3))
          print("Runs scored from four(s) : ", count(df_raina,4))
          print("Runs scored from six(s) : ", count(df_raina,6))
```

```
Runs scored from single(s) :  1377
Runs scored from double(s) :  484
Runs scored from 3'(s) :  30
Runs scored from four(s) :  1608
Runs scored from six(s) :  1044
```

36. The match that had biggest win in terms of runs margin

```
In [326]: # The match that had biggest win in terms of runs margin
          match_data[match_data['win_by_runs']==match_data['win_by_runs'].max()]
```

Out[326]:

	id	season	city	date	team1	team2	toss_winner	toss_decision	result	dl_applied	winner	win_by_runs	win_by_wickets	player_of_match	venue
43	44	2017	Delhi	06-05-2017	Mumbai Indians	Delhi Daredevils	Delhi Daredevils	field	normal	0	Mumbai Indians	146	0	LMP Simmons	Feroz Shah Kotla

37. The match that had biggest win in terms of wickets margin

```
In [327]: # The match that had biggest win in terms of wickets margin
          match_data[match_data['win_by_wickets']==match_data['win_by_wickets'].max()]
```

Out[327]:

	id	season	city	date	team1	team2	toss_winner	toss_decision	result	dl_applied	winner	win_by_runs	win_by_wickets	player_o
2	3	2017	Rajkot	07-04-2017	Gujarat Lions	Kolkata Knight Riders	Kolkata Knight Riders	field	normal	0	Kolkata Knight Riders	0	10	
34	35	2017	Chandigarh	30-04-2017	Delhi Daredevils	Kings XI Punjab	Kings XI Punjab	field	normal	0	Kings XI Punjab	0	10	Sandeep
71	72	2008	Mumbai	27-04-2008	Mumbai Indians	Deccan Chargers	Deccan Chargers	field	normal	0	Deccan Chargers	0	10	AC
119	120	2009	Cape Town	19-04-2009	Kings XI Punjab	Delhi Daredevils	Delhi Daredevils	field	normal	1	Delhi Daredevils	0	10	D
183	184	2010	Bangalore	18-03-2010	Rajasthan Royals	Royal Challengers Bangalore	Royal Challengers Bangalore	field	normal	0	Royal Challengers Bangalore	0	10	.
298	299	2011	Mumbai	20-05-2011	Mumbai Indians	Rajasthan Royals	Mumbai Indians	bat	normal	0	Rajasthan Royals	0	10	SR
376	377	2012	Jaipur	20-05-2012	Rajasthan Royals	Mumbai Indians	Rajasthan Royals	bat	normal	0	Mumbai Indians	0	10	D
390	391	2013	Chandigarh	10-04-2013	Kings XI Punjab	Chennai Super Kings	Chennai Super Kings	field	normal	0	Chennai Super Kings	0	10	MEK
542	543	2015	Delhi	26-04-2015	Delhi Daredevils	Royal Challengers Bangalore	Royal Challengers Bangalore	field	normal	0	Royal Challengers Bangalore	0	10	V

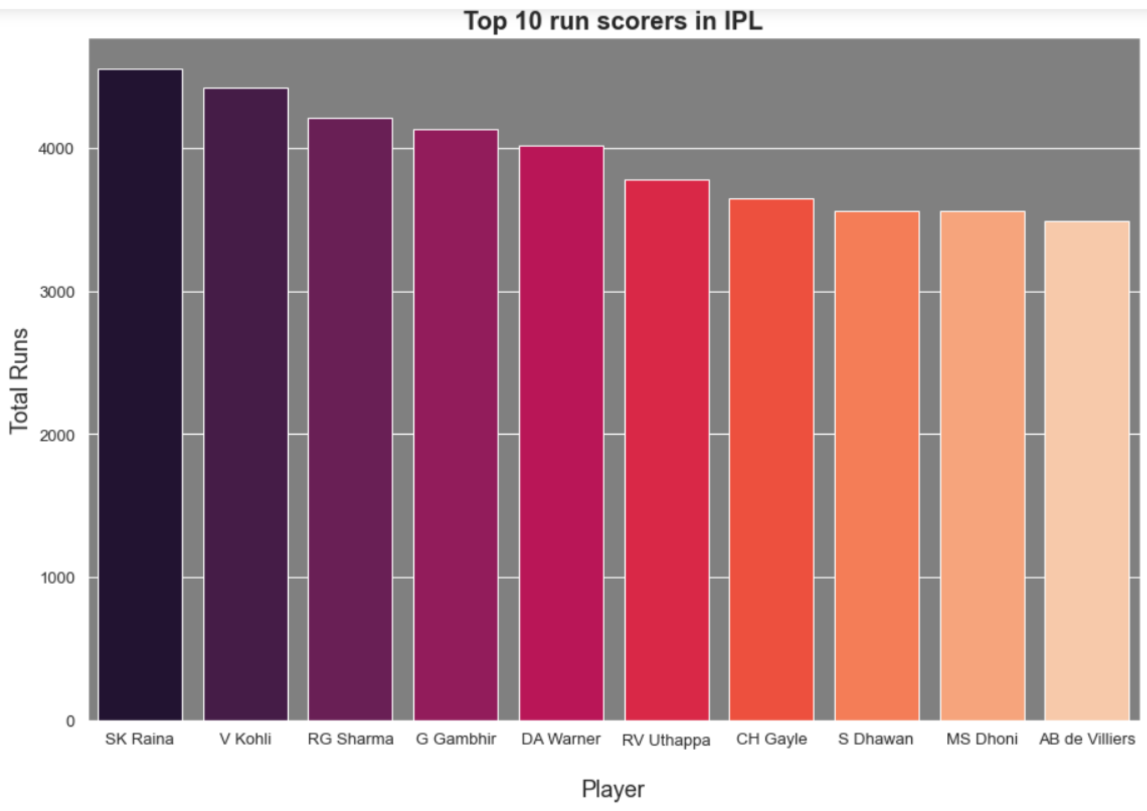
38. Player with most runs in the tournament.

```
In [328]: # Player with most runs in the tournament.
          runs = ball_data.groupby(['batsman'])['batsman_runs'].sum().reset_index()
          runs.columns = ['Batsman', 'Runs']
          y = runs.sort_values(by = 'Runs', ascending = False).head(10).reset_index().drop('index', axis = 1)
          y
```

Out[328]:

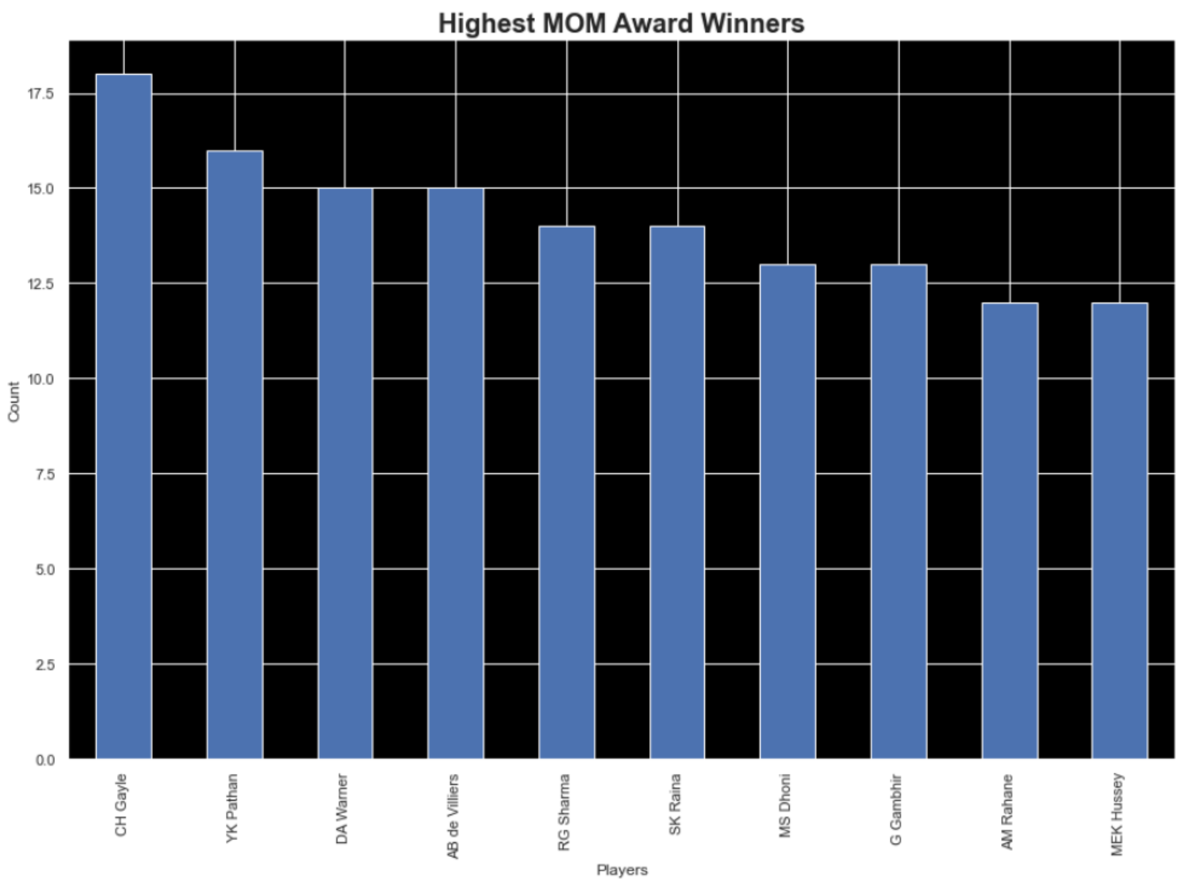
	Batsman	Runs
0	SK Raina	4548
1	V Kohli	4423
2	RG Sharma	4207
3	G Gambhir	4132
4	DA Warner	4014
5	RV Uthappa	3778
6	CH Gayle	3651
7	S Dhawan	3561
8	MS Dhoni	3560
9	AB de Villiers	3486

```
In [329]: ax = plt.axes()
          ax.set(facecolor = "grey")
          sns.barplot(x=y['Batsman'], y=y['Runs'], palette='rocket', saturation=1)
          plt.xticks(fontsize=13)
          plt.yticks(fontsize=13)
          plt.xlabel('\nPlayer', fontsize=18)
          plt.ylabel('Total Runs', fontsize=18)
          plt.title('Top 10 run scorers in IPL', fontsize=20, fontweight="bold")
          plt.show()
```



39. Highest MOM award winners

```
In [330]: # Highest MOM award winners
ax = plt.axes()
ax.set(facecolor = "black")
match_data.player_of_match.value_counts()[:10].plot(kind='bar')
plt.xlabel('Players')
plt.ylabel('Count')
plt.title('Highest MOM Award Winners', fontsize=20, fontweight="bold")
plt.show()
```



Conclusion

Over 39 different analyses were performed considering different assumptions.