```python
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt


deliveries = pd.read_csv("deliveries.csv")

deliveries.head()
```

```
   match_id  inning           batting_team
bowling_team  over  \
0    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
1    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
2    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
3    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
4    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0

   ball       batter   bowler  non_striker  batsman_runs
extra_runs  \
0     1   SC Ganguly  P Kumar  BB McCullum             0           1

1     2  BB McCullum  P Kumar   SC Ganguly             0           0

2     3  BB McCullum  P Kumar   SC Ganguly             0           1

3     4  BB McCullum  P Kumar   SC Ganguly             0           0

4     5  BB McCullum  P Kumar   SC Ganguly             0           0


   total_runs extras_type  is_wicket player_dismissed dismissal_kind
fielder
0           1     legbyes          0              NaN            NaN
NaN
1           0         NaN          0              NaN            NaN
NaN
2           1       wides          0              NaN            NaN
NaN
3           0         NaN          0              NaN            NaN
NaN
4           0         NaN          0              NaN            NaN
NaN
```

# handling null values

```
deliveries.isnull().sum()
```

```
match_id                 0
inning                   0
batting_team             0
bowling_team             0
over                     0
ball                     0
batter                   0
bowler                   0
non_striker              0
batsman_runs             0
extra_runs               0
total_runs               0
extras_type              0
is_wicket                0
player_dismissed    247970
dismissal_kind      247970
fielder             251566
dtype: int64
```

```
deliveries['extras_type'].fillna('No Extra', inplace=True)
deliveries['player_dismissed'].fillna('Survived', inplace=True)
deliveries['dismissal_kind'].fillna('Not Out', inplace=True)
deliveries['fielder'].fillna('na', inplace=True)
```

```
deliveries.head(100)
```

```
    match_id  inning           batting_team
bowling_team  \
0     335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
1     335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
2     335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
3     335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
4     335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
..       ...     ...                    ...                           .
..
95    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
96    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
97    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
```

```
98    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore
99    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore

    over  ball       batter     bowler  non_striker  batsman_runs
extra_runs  \
0      0     1   SC Ganguly    P Kumar  BB McCullum             0
1
1      0     2  BB McCullum    P Kumar   SC Ganguly             0
0
2      0     3  BB McCullum    P Kumar   SC Ganguly             0
1
3      0     4  BB McCullum    P Kumar   SC Ganguly             0
0
4      0     5  BB McCullum    P Kumar   SC Ganguly             0
0
..   ...   ...          ...        ...          ...           ...
...
95    15     2    DJ Hussey  AA Noffke  BB McCullum             1
0
96    15     3  BB McCullum  AA Noffke    DJ Hussey             2
0
97    15     4  BB McCullum  AA Noffke    DJ Hussey             0
0
98    15     5  BB McCullum  AA Noffke    DJ Hussey             1
0
99    15     6    DJ Hussey  AA Noffke  BB McCullum             0
0

    total_runs extras_type  is_wicket player_dismissed dismissal_kind
fielder
0            1     legbyes          0         Survived        Not Out
na
1            0    No Extra          0         Survived        Not Out
na
2            1       wides          0         Survived        Not Out
na
3            0    No Extra          0         Survived        Not Out
na
4            0    No Extra          0         Survived        Not Out
na
..         ...         ...        ...              ...            ...
...
95           1    No Extra          0         Survived        Not Out
na
96           2    No Extra          0         Survived        Not Out
na
97           0    No Extra          0         Survived        Not Out
```

```
na
98           1    No Extra          0         Survived        Not Out
na
99           0    No Extra          0         Survived        Not Out
na

[100 rows x 17 columns]
```

```
deliveries.isnull().sum()
```

```
match_id            0
inning              0
batting_team        0
bowling_team        0
over                0
ball                0
batter              0
bowler              0
non_striker         0
batsman_runs        0
extra_runs          0
total_runs          0
extras_type         0
is_wicket           0
player_dismissed    0
dismissal_kind      0
fielder             0
dtype: int64
```

# Hence There are no Null Values Now

# understanding the structure and basic characteristics of the dataset.

```
deliveries.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 260920 entries, 0 to 260919
Data columns (total 17 columns):
 #   Column            Non-Null Count   Dtype
---  ------            --------------   -----
 0   match_id          260920 non-null  int64
 1   inning            260920 non-null  int64
 2   batting_team      260920 non-null  object
 3   bowling_team      260920 non-null  object
 4   over              260920 non-null  int64 
 5   ball              260920 non-null  int64 
 6   batter            260920 non-null  object
 7   bowler            260920 non-null  object
 8   non_striker       260920 non-null  object
 9   batsman_runs      260920 non-null  int64 
 10  extra_runs        260920 non-null  int64 
 11  total_runs        260920 non-null  int64 
 12  extras_type       260920 non-null  object
 13  is_wicket         260920 non-null  int64 
 14  player_dismissed  260920 non-null  object
 15  dismissal_kind    260920 non-null  object
 16  fielder           260920 non-null  object
dtypes: int64(8), object(9)
memory usage: 33.8+ MB
```

# descriptive statistics for all the numerical columns in the dataset.

```
deliveries.describe()
```

```
           match_id         inning           over           ball  \
count  2.609200e+05  260920.000000  260920.000000  260920.000000   
mean   9.070665e+05       1.483531       9.197677       3.624486   
std    3.679913e+05       0.502643       5.683484       1.814920   
min    3.359820e+05       1.000000       0.000000       1.000000   
25%    5.483340e+05       1.000000       4.000000       2.000000   
50%    9.809670e+05       1.000000       9.000000       4.000000   
75%    1.254066e+06       2.000000      14.000000       5.000000   
max    1.426312e+06       6.000000      19.000000      11.000000   

        batsman_runs     extra_runs     total_runs      is_wicket  
count  260920.000000  260920.000000  260920.000000  260920.000000  
mean        1.265001       0.067806       1.332807       0.049632  
std         1.639298       0.343265       1.626416       0.217184  
min         0.000000       0.000000       0.000000       0.000000  
25%         0.000000       0.000000       0.000000       0.000000  
50%         1.000000       0.000000       1.000000       0.000000  
75%         1.000000       0.000000       1.000000       0.000000  
max         6.000000       7.000000       7.000000       1.000000  
```

# Importing New Dataset ie. Matches

```
matches = pd.read_csv("matches.csv")
matches.head()
```

```
       id   season        city        date match_type player_of_match
\
0  335982  2007/08   Bangalore  2008-04-18     League     BB McCullum

1  335983  2007/08  Chandigarh  2008-04-19     League      MEK Hussey

2  335984  2007/08       Delhi  2008-04-19     League     MF Maharoof

3  335985  2007/08      Mumbai  2008-04-20     League      MV Boucher

4  335986  2007/08     Kolkata  2008-04-20     League       DJ Hussey


                                        venue
team1  \
0                       M Chinnaswamy Stadium  Royal Challengers
Bangalore
1  Punjab Cricket Association Stadium, Mohali              Kings XI
Punjab
2                            Feroz Shah Kotla             Delhi
Daredevils
3                            Wankhede Stadium               Mumbai
Indians
4                                Eden Gardens        Kolkata Knight
Riders

                         team2                  toss_winner
toss_decision  \
0        Kolkata Knight Riders  Royal Challengers Bangalore
field
1          Chennai Super Kings          Chennai Super Kings
bat
2             Rajasthan Royals             Rajasthan Royals
bat
3  Royal Challengers Bangalore               Mumbai Indians
bat
4              Deccan Chargers              Deccan Chargers
bat

                        winner   result  result_margin  target_runs  \
0        Kolkata Knight Riders     runs          140.0        223.0
1          Chennai Super Kings     runs           33.0        241.0
2             Delhi Daredevils  wickets            9.0        130.0
3  Royal Challengers Bangalore  wickets            5.0        166.0
4        Kolkata Knight Riders  wickets            5.0        111.0

   target_overs super_over method    umpire1        umpire2
0          20.0          N    NaN  Asad Rauf     RE Koertzen
1          20.0          N    NaN  MR Benson      SL Shastri
2          20.0          N    NaN  Aleem Dar  GA Pratapkumar
```

```
3           20.0           N     NaN    SJ Davis       DJ Harper
4           20.0           N     NaN   BF Bowden     K Hariharan
```

# Handling Null Values

```
matches.isnull().sum()
# there were null values which were taken care off

id                  0
season              0
city                0
date                0
match_type          0
player_of_match     0
venue               0
team1               0
team2               0
toss_winner         0
toss_decision       0
winner              0
result              0
result_margin       0
target_runs         0
target_overs        0
super_over          0
method              0
umpire1             0
umpire2             0
dtype: int64

matches['city'] = matches['city'].fillna('Neutral')
matches['player_of_match'] = matches['player_of_match'].fillna('Not
Declared')
matches['winner'] = matches['winner'].fillna('No Result')
matches['result_margin'] = matches['result_margin'].fillna(0)
matches['target_runs'] = matches['target_runs'].fillna(0)
matches['target_overs'] = matches['target_overs'].fillna(0)
matches['method'] = matches['method'].fillna('Completed Game')

matches.head()

       id   season        city        date match_type player_of_match
\
0  335982  2007/08   Bangalore  2008-04-18     League     BB McCullum

1  335983  2007/08  Chandigarh  2008-04-19     League      MEK Hussey

2  335984  2007/08       Delhi  2008-04-19     League     MF Maharoof
```

```
3  335985  2007/08      Mumbai  2008-04-20     League      MV Boucher

4  335986  2007/08     Kolkata  2008-04-20     League       DJ Hussey


                                        venue
team1  \
0                       M Chinnaswamy Stadium  Royal Challengers
Bangalore
1  Punjab Cricket Association Stadium, Mohali              Kings XI
Punjab
2                            Feroz Shah Kotla            Delhi
Daredevils
3                            Wankhede Stadium              Mumbai
Indians
4                                Eden Gardens        Kolkata Knight
Riders

                         team2                  toss_winner
toss_decision  \
0        Kolkata Knight Riders  Royal Challengers Bangalore
field
1          Chennai Super Kings          Chennai Super Kings
bat
2             Rajasthan Royals             Rajasthan Royals
bat
3  Royal Challengers Bangalore               Mumbai Indians
bat
4              Deccan Chargers              Deccan Chargers
bat

                        winner   result  result_margin  target_runs  \
0        Kolkata Knight Riders     runs          140.0        223.0
1          Chennai Super Kings     runs           33.0        241.0
2             Delhi Daredevils  wickets            9.0        130.0
3  Royal Challengers Bangalore  wickets            5.0        166.0
4        Kolkata Knight Riders  wickets            5.0        111.0

   target_overs super_over  method    umpire1        umpire2
0          20.0          N    20.0  Asad Rauf     RE Koertzen
1          20.0          N    20.0  MR Benson      SL Shastri
2          20.0          N    20.0  Aleem Dar  GA Pratapkumar
3          20.0          N    20.0   SJ Davis       DJ Harper
4          20.0          N    20.0  BF Bowden     K Hariharan
```

# understanding the structure and basic characteristics of the dataset.

```
matches.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1095 entries, 0 to 1094
Data columns (total 20 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   id               1095 non-null   int64  
 1   season           1095 non-null   object 
 2   city             1095 non-null   object 
 3   date             1095 non-null   object 
 4   match_type       1095 non-null   object 
 5   player_of_match  1095 non-null   object 
 6   venue            1095 non-null   object 
 7   team1            1095 non-null   object 
 8   team2            1095 non-null   object 
 9   toss_winner      1095 non-null   object 
 10  toss_decision    1095 non-null   object 
 11  winner           1095 non-null   object 
 12  result           1095 non-null   object 
 13  result_margin    1095 non-null   float64
 14  target_runs      1095 non-null   float64
 15  target_overs     1095 non-null   float64
 16  super_over       1095 non-null   object 
 17  method           1095 non-null   float64
 18  umpire1          1095 non-null   object 
 19  umpire2          1095 non-null   object 
dtypes: float64(4), int64(1), object(15)
memory usage: 171.2+ KB
```

```
matches.describe()
```

```
                 id  result_margin  target_runs  target_overs
method
count  1.095000e+03    1095.000000  1095.000000   1095.000000
1095.000000
mean   9.048283e+05      16.959817   165.230137     19.705205
19.705205
std    3.677402e+05      21.714792    34.487313      1.887000
1.887000
min    3.359820e+05       0.000000     0.000000      0.000000
0.000000
25%    5.483315e+05       5.000000   146.000000     20.000000
20.000000
50%    9.809610e+05       8.000000   166.000000     20.000000
20.000000
```

```
75%    1.254062e+06      19.000000   187.000000     20.000000
20.000000
max    1.426312e+06     146.000000   288.000000     20.000000
20.000000
```

# Merging Both Data for complete analysis

```
# Merging deliveries with match details using match_id
merged_df = deliveries.merge(matches, left_on='match_id',
right_on='id', how='left')

# Check the merged data
merged_df.head()

   match_id  inning         batting_team
bowling_team  over  \
0    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
1    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
2    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
3    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
4    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0

   ball       batter   bowler  non_striker  batsman_runs  ...
toss_decision  \
0     1    SC Ganguly  P Kumar  BB McCullum             0  ...
field
1     2   BB McCullum  P Kumar   SC Ganguly             0  ...
field
2     3   BB McCullum  P Kumar   SC Ganguly             0  ...
field
3     4   BB McCullum  P Kumar   SC Ganguly             0  ...
field
4     5   BB McCullum  P Kumar   SC Ganguly             0  ...
field

                  winner result  result_margin target_runs
target_overs  \
0  Kolkata Knight Riders   runs          140.0       223.0
20.0
1  Kolkata Knight Riders   runs          140.0       223.0
20.0
2  Kolkata Knight Riders   runs          140.0       223.0
20.0
```

```
3  Kolkata Knight Riders    runs          140.0       223.0
20.0
4  Kolkata Knight Riders    runs          140.0       223.0
20.0

  super_over  method    umpire1      umpire2
0          N    20.0  Asad Rauf  RE Koertzen
1          N    20.0  Asad Rauf  RE Koertzen
2          N    20.0  Asad Rauf  RE Koertzen
3          N    20.0  Asad Rauf  RE Koertzen
4          N    20.0  Asad Rauf  RE Koertzen

[5 rows x 37 columns]
```

```
# Checking for missing values after merging
merged_df.isnull().sum()
```

```
match_id            0
inning              0
batting_team        0
bowling_team        0
over                0
ball                0
batter              0
bowler              0
non_striker         0
batsman_runs        0
extra_runs          0
total_runs          0
extras_type         0
is_wicket           0
player_dismissed    0
dismissal_kind      0
fielder             0
id                  0
season              0
city                0
date                0
match_type          0
player_of_match     0
venue               0
team1               0
team2               0
toss_winner         0
toss_decision       0
winner              0
result              0
result_margin       0
target_runs         0
target_overs        0
```

```
super_over          0
method              0
umpire1             0
umpire2             0
dtype: int64
```

```
merged_df.dtypes
```

```
match_id              int64
inning                int64
batting_team         object
bowling_team         object
over                  int64
ball                  int64
batter               object
bowler               object
non_striker          object
batsman_runs          int64
extra_runs            int64
total_runs            int64
extras_type          object
is_wicket             int64
player_dismissed     object
dismissal_kind       object
fielder              object
id                    int64
season               object
city                 object
date                 object
match_type           object
player_of_match      object
venue                object
team1                object
team2                object
toss_winner          object
toss_decision        object
winner               object
result               object
result_margin       float64
target_runs         float64
target_overs        float64
super_over           object
method              float64
umpire1              object
umpire2              object
dtype: object
```

```
# Removing duplicate rows
merged_df.drop_duplicates(inplace=True)
```

```
# Saving cleaned data
merged_df.to_csv('cleaned_ipl_data.csv', index=False)
```

# Top Run Scorers

```
top_scorers = merged_df.groupby('batter')
['batsman_runs'].sum().reset_index()

top_scorers = top_scorers.sort_values('batsman_runs',
ascending=False).head(10)

# Display top 10 run-scorers
print("\n Top 10 Run Scorers:")
print(top_scorers)
```

```
 Top 10 Run Scorers:
             batter  batsman_runs
631         V Kohli          8014
512        S Dhawan          6769
477       RG Sharma          6630
147       DA Warner          6567
546        SK Raina          5536
374        MS Dhoni          5243
30   AB de Villiers          5181
124        CH Gayle          4997
501      RV Uthappa          4954
282      KD Karthik          4843
```

# Top Wicket-Takers

```
# Filter only wicket deliveries (non-NA player_dismissed)
wicket_df = merged_df[merged_df['player_dismissed'].notna()]

# Count the number of wickets per bowler
top_wicket_takers = wicket_df.groupby('bowler')
['player_dismissed'].count().reset_index()

# Rename column
top_wicket_takers.rename(columns={'player_dismissed': 'wickets'},
inplace=True)

top_wicket_takers = top_wicket_takers.sort_values('wickets',
ascending=False).head(10)

# Display top 10 wicket-takers
```

```
print("\n Top 10 Wicket-Takers:")
print(top_wicket_takers)
```

```
 Top 10 Wicket-Takers:
              bowler  wickets
355         R Ashwin     4679
446        SP Narine     4146
71           B Kumar     4060
348        PP Chawla     3895
373        RA Jadeja     3895
524        YS Chahal     3628
163  Harbhajan Singh     3496
8           A Mishra     3444
119         DJ Bravo     3296
494         UT Yadav     3190
```

# Best Strike Rate (Min 100 Balls Faced)

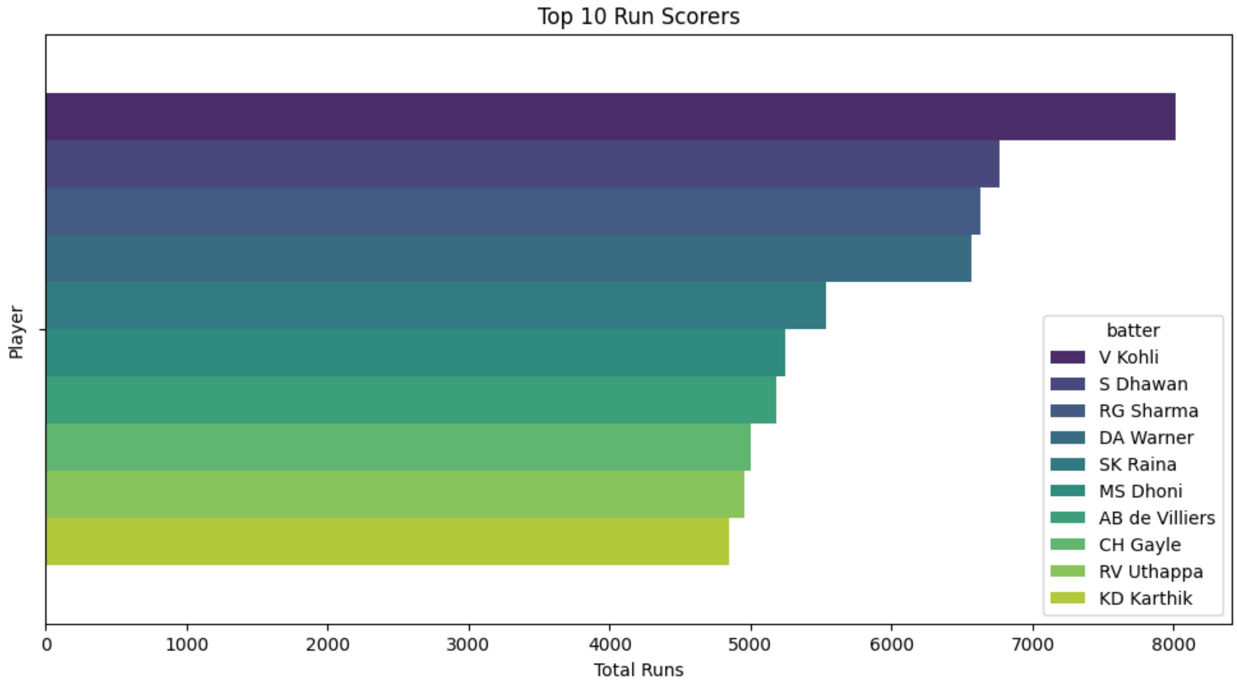
```
balls_faced = merged_df.groupby('batter')
['ball'].count().reset_index()
runs_scored = merged_df.groupby('batter')
['batsman_runs'].sum().reset_index()

# Merge both DataFrames
strike_rate_df = pd.merge(runs_scored, balls_faced, on='batter')

#strike rate
strike_rate_df['strike_rate'] = (strike_rate_df['batsman_runs'] /
strike_rate_df['ball']) * 100

# Filter players with at least 100 balls faced
strike_rate_df = strike_rate_df[strike_rate_df['ball'] >= 100]

# Sort by strike rate in descending order
top_strike_rate = strike_rate_df.sort_values('strike_rate',
ascending=False).head(10)

print("\n Top 10 Strike Rates (Min 100 Balls Faced):")
print(top_strike_rate[['batter', 'strike_rate']])
```

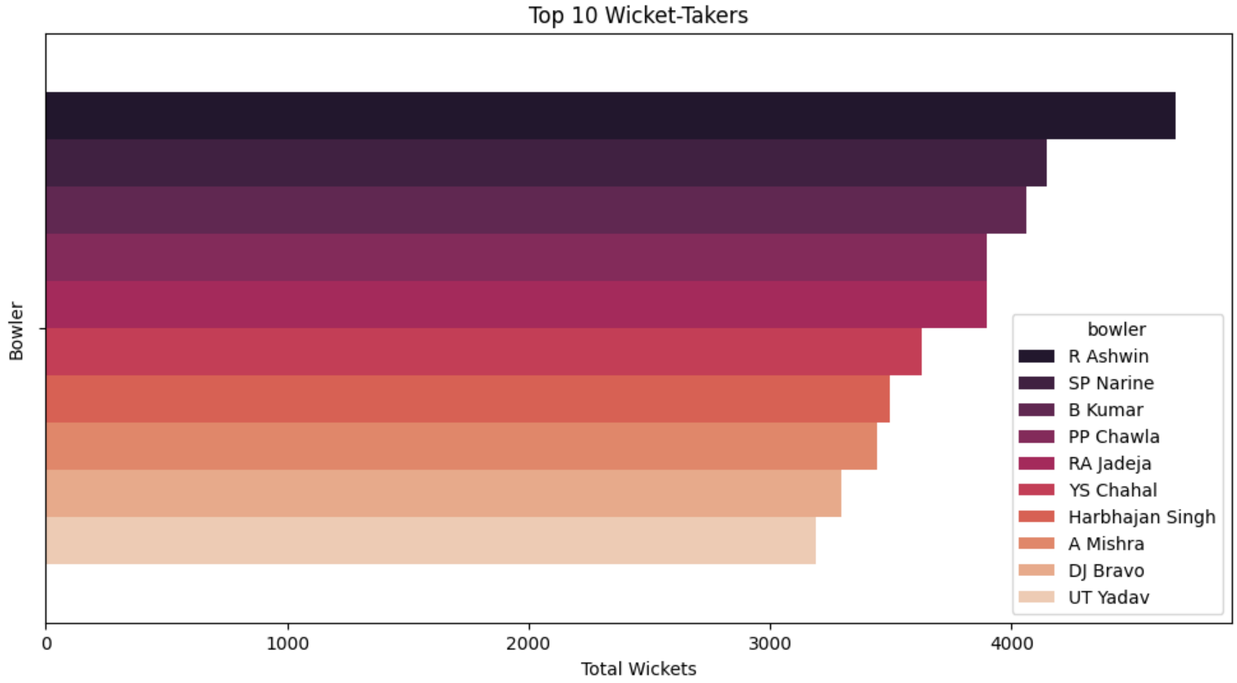
```
 Top 10 Strike Rates (Min 100 Balls Faced):
              batter  strike_rate
234  J Fraser-McGurk   220.000000
652         WG Jacks   172.932331
433          PD Salt   169.610390
606         T Stubbs   169.456067
617          TM Head   168.558952
```

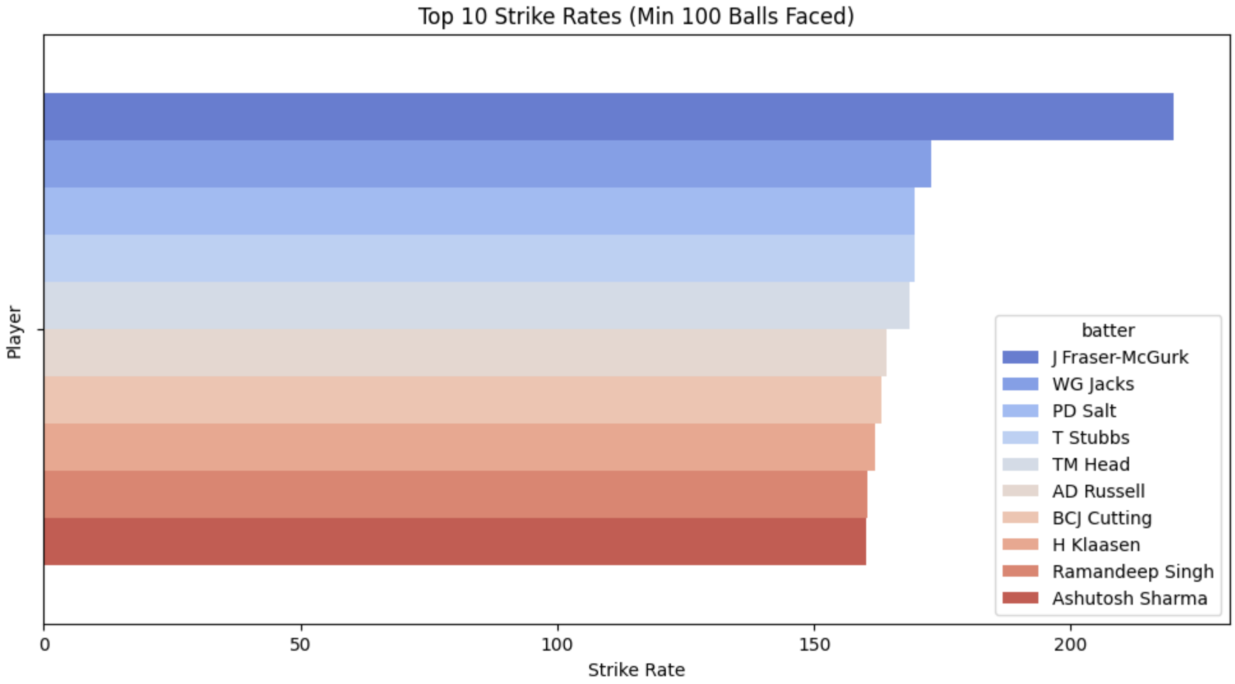
```
39         AD Russell   164.224422
105       BCJ Cutting   163.013699
208         H Klaasen   161.990212
503  Ramandeep Singh   160.377358
85   Ashutosh Sharma   160.169492
```

## Plotting the Results

```
plt.figure(figsize=(12, 6))
sns.barplot(x='batsman_runs', hue ='batter', data=top_scorers, 
palette='viridis')
plt.title('Top 10 Run Scorers')
plt.xlabel('Total Runs')
plt.ylabel('Player')
plt.show()

# Plotting top wicket-takers
plt.figure(figsize=(12, 6))
sns.barplot(x='wickets', hue ='bowler', data=top_wicket_takers, 
palette='rocket')
plt.title('Top 10 Wicket-Takers')
plt.xlabel('Total Wickets')
plt.ylabel('Bowler')
plt.show()

# Plotting top strike rates
plt.figure(figsize=(12, 6))
sns.barplot(x='strike_rate', hue ='batter', data=top_strike_rate, 
palette='coolwarm')
plt.title('Top 10 Strike Rates (Min 100 Balls Faced)')
plt.xlabel('Strike Rate')
plt.ylabel('Player')
plt.show()
```


Top 10 Run Scorers
Player
Total Runs
0
1000
2000
3000
4000
5000
6000
7000
8000
batter
V Kohli
S Dhawan
RG Sharma
DA Warner
SK Raina
MS Dhoni
AB de Villiers
CH Gayle
RV Uthappa
KD Karthik


Top 10 Wicket-Takers
Bowler
Total Wickets
0
1000
2000
3000
4000
bowler
R Ashwin
SP Narine
B Kumar
PP Chawla
RA Jadeja
YS Chahal
Harbhajan Singh
A Mishra
DJ Bravo
UT Yadav



# Calculate Win/Loss Ratio

```
#total matches played by each team
matches_played = pd.concat([merged_df['team1'],
merged_df['team2']]).value_counts().reset_index()
matches_played.columns = ['team', 'matches_played']

# Count wins by each team
team_wins = merged_df['winner'].value_counts().reset_index()
team_wins.columns = ['team', 'wins']

# Merge the two DataFrames
win_loss_df = pd.merge(matches_played, team_wins, on='team',
how='left').fillna(0)

# Calculate losses
win_loss_df['losses'] = win_loss_df['matches_played'] -
win_loss_df['wins']

# Calculate win/loss ratio
win_loss_df['win_loss_ratio'] = win_loss_df['wins'] /
win_loss_df['losses'].replace(0, np.nan)

# Sort by win/loss ratio
win_loss_df = win_loss_df.sort_values('win_loss_ratio',
ascending=False).fillna(0)
```

```python
# Display results
print("\n Win/Loss Ratio by Team:")
print(win_loss_df)
```

```

 Win/Loss Ratio by Team:
                           team  matches_played   wins  losses
win_loss_ratio
12               Gujarat Titans           10795   6793    4002
1.697401
15       Rising Pune Supergiant            3828   2383    1445
1.649135
2           Chennai Super Kings           57227  33388   23839
1.400562
13         Lucknow Super Giants           10626   5932    4694
1.263741
0                Mumbai Indians           62942  34629   28313
1.223078
8                Delhi Capitals           22162  11641   10521
1.106454
1         Kolkata Knight Riders           59177  30820   28357
1.086857
4              Rajasthan Royals           52674  27029   25645
1.053968
3   Royal Challengers Bangalore           56563  27319   29244
0.934175
6           Sunrisers Hyderabad           43560  20946   22614
0.926240
5               Kings XI Punjab           45129  20948   24181
0.866300
16  Royal Challengers Bengaluru            3619   1668    1951
0.854946
10                 Punjab Kings           13552   5839    7713
0.757034
14                Gujarat Lions            7111   3063    4048
0.756670
7              Delhi Daredevils           37511  15709   21802
0.720530
17         Kochi Tuskers Kerala            3196   1322    1874
0.705443
9               Deccan Chargers           18073   7013   11060
0.634087
18      Rising Pune Supergiants            3195   1105    2090
0.528708
11                Pune Warriors           10900   2883    8017
0.359611
```

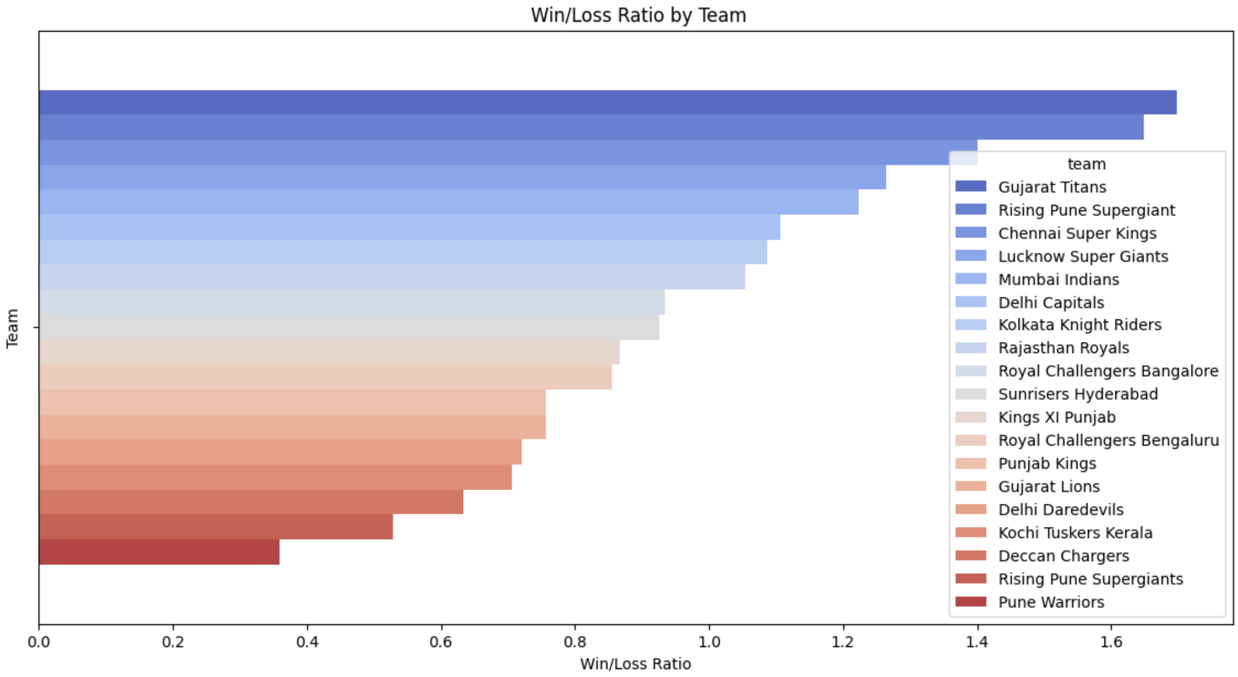
# Highest and Lowest Team Scores

```python
# Group by match_id and team, summing the total runs for each match
team_scores = merged_df.groupby(['match_id', 'batting_team'])
['total_runs'].sum().reset_index()

# Find highest and lowest team scores
highest_scores = team_scores.sort_values('total_runs',
ascending=False).head(10)
lowest_scores = team_scores.sort_values('total_runs',
ascending=True).head(10)

print("\n Top 10 Highest Team Scores:")
print(highest_scores)

print("\n Bottom 10 Lowest Team Scores:")
print(lowest_scores)
```

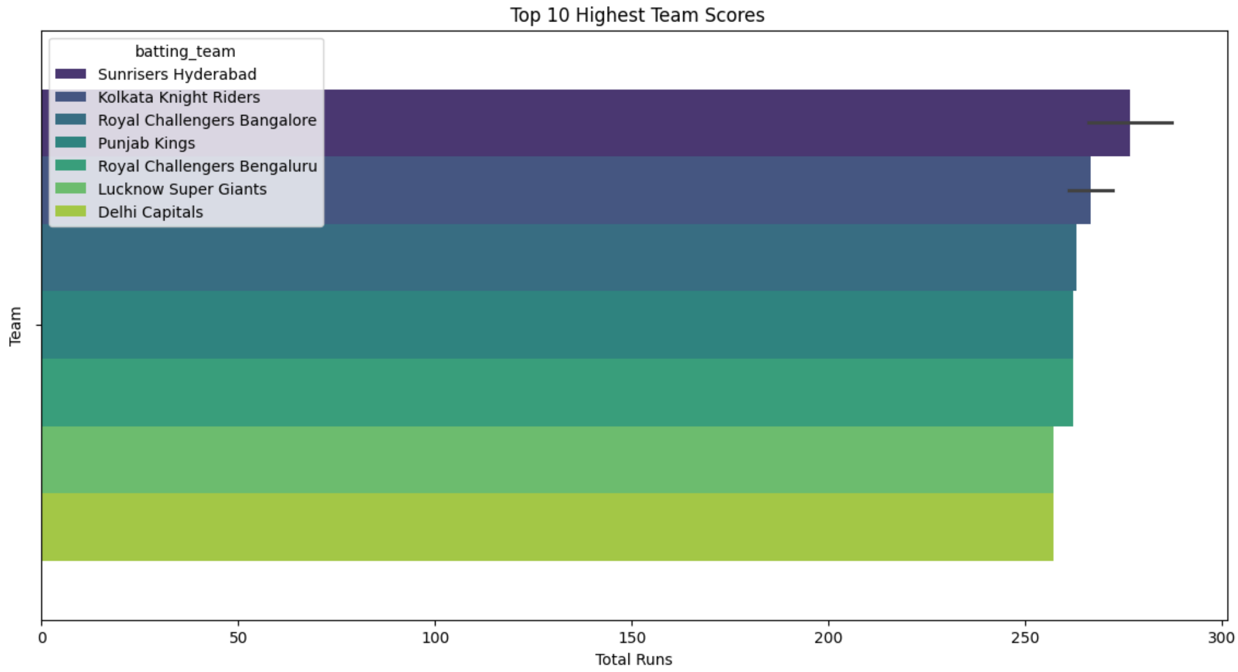
```
 Top 10 Highest Team Scores:
      match_id                 batting_team  total_runs
2104   1426268          Sunrisers Hyderabad         287
2060   1422126          Sunrisers Hyderabad         277
2076   1422134        Kolkata Knight Riders         272
2114   1426273          Sunrisers Hyderabad         266
702     598027  Royal Challengers Bangalore         263
2128   1426280                 Punjab Kings         262
2103   1426268  Royal Challengers Bengaluru         262
2127   1426280        Kolkata Knight Riders         261
1972   1359512         Lucknow Super Giants         257
2129   1426281               Delhi Capitals         257

 Bottom 10 Lowest Team Scores:
      match_id                 batting_team  total_runs
1021    829813  Royal Challengers Bangalore           2
1486   1178424             Rajasthan Royals          41
858     733993          Sunrisers Hyderabad          44
1264   1082648        Kolkata Knight Riders          48
1205   1082617  Royal Challengers Bangalore          49
86      336025          Chennai Super Kings          55
482     501265             Delhi Daredevils          56
118     392182             Rajasthan Royals          58
120     392183             Delhi Daredevils          58
2015   1359534             Rajasthan Royals          59
```

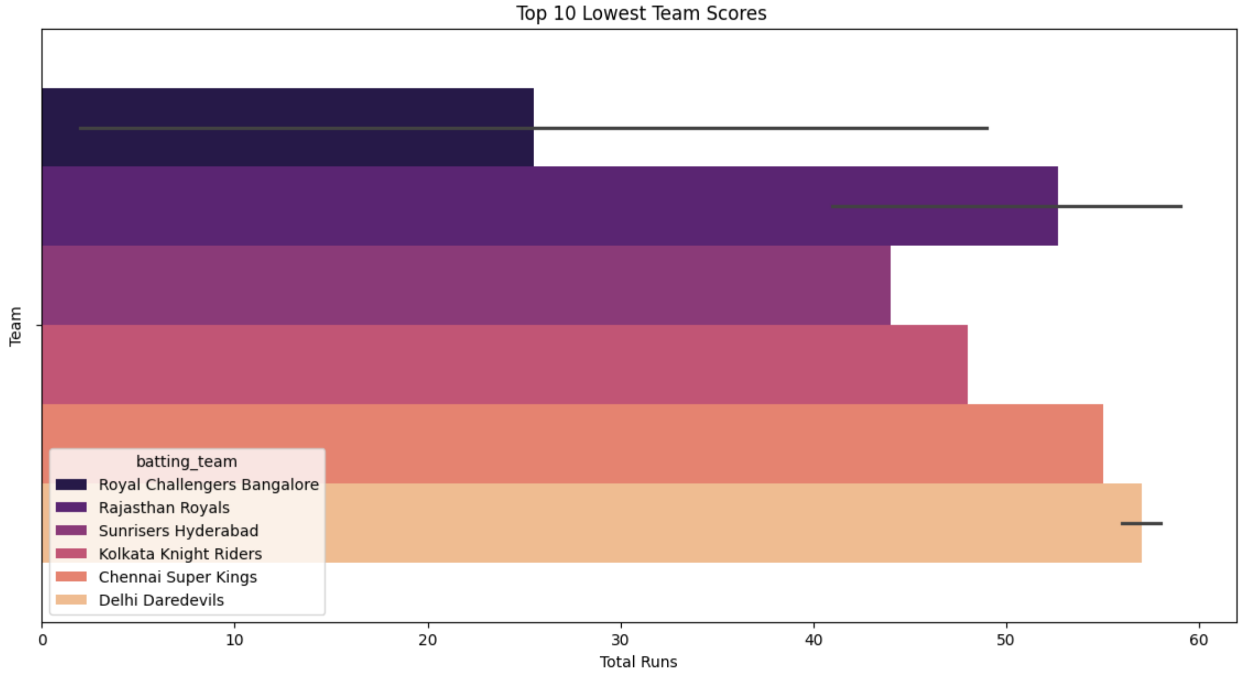
# Plot the Results

```
# Plotting Win/Loss Ratio
plt.figure(figsize=(14, 7))
sns.barplot(x='win_loss_ratio', hue ='team',
data=win_loss_df.sort_values('win_loss_ratio', ascending=False),
palette='coolwarm')
plt.title(' Win/Loss Ratio by Team')
plt.xlabel('Win/Loss Ratio')
plt.ylabel('Team')
plt.show()
```



```
# Plot Highest Team Scores
plt.figure(figsize=(14, 7))
sns.barplot(x='total_runs', hue ='batting_team', data=highest_scores,
palette='viridis')
plt.title(' Top 10 Highest Team Scores')
plt.xlabel('Total Runs')
plt.ylabel('Team')
plt.show()

# Plot Lowest Team Scores
plt.figure(figsize=(14, 7))
sns.barplot(x='total_runs', hue ='batting_team', data=lowest_scores,
palette='magma')
plt.title(' Top 10 Lowest Team Scores')
plt.xlabel('Total Runs')
plt.ylabel('Team')
plt.show()
```





# Calculated Run Rates by Team and Match

```
# Group by match_id and team to calculate total runs and total balls
faced
run_rate_df = merged_df.groupby(['match_id', 'batting_team']).agg(
    total_runs=('total_runs', 'sum'),
    balls_faced=('ball', 'count')
).reset_index()

# Convert balls to overs (6 balls = 1 over)
run_rate_df['overs'] = run_rate_df['balls_faced'] // 6 +
(run_rate_df['balls_faced'] % 6) / 6

# Calculate run rate
run_rate_df['run_rate'] = run_rate_df['total_runs'] /
run_rate_df['overs'].replace(0, np.nan)

print("\n Run Rate by Team and Match:")
print(run_rate_df.head(10))
```

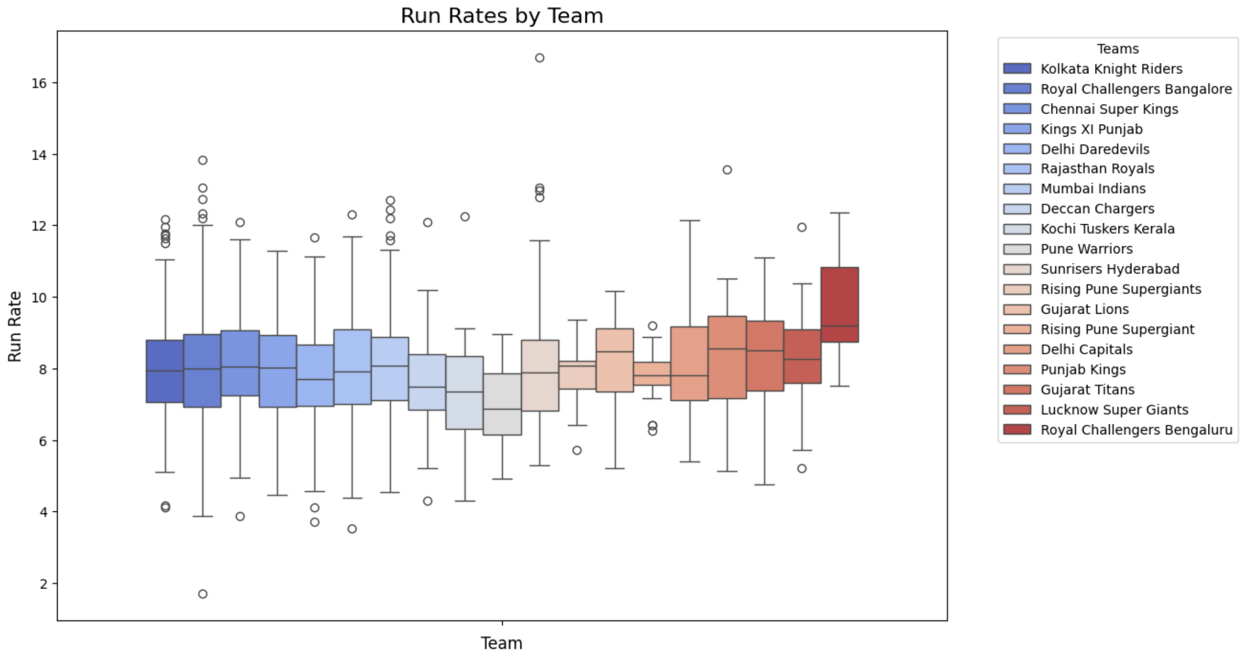
```
 Run Rate by Team and Match:
   match_id                 batting_team  total_runs  balls_faced
overs  \
0    335982        Kolkata Knight Riders         222          124
20.666667
1    335982  Royal Challengers Bangalore          82          101
16.833333
2    335983          Chennai Super Kings         240          124
20.666667
3    335983              Kings XI Punjab         207          124
20.666667
4    335984             Delhi Daredevils         132           97
16.166667
5    335984             Rajasthan Royals         129          122
20.333333
6    335985               Mumbai Indians         165          123
20.500000
7    335985  Royal Challengers Bangalore         166          123
20.500000
8    335986              Deccan Chargers         110          118
19.666667
9    335986        Kolkata Knight Riders         112          122
20.333333

    run_rate
0  10.741935
1   4.871287
2  11.612903
3  10.016129
```

```
4    8.164948
5    6.344262
6    8.048780
7    8.097561
8    5.593220
9    5.508197
```

```
boundaries_df = merged_df[merged_df['batsman_runs'] ==
4].groupby('batting_team').size().reset_index(name='boundaries')
sixes_df = merged_df[merged_df['batsman_runs'] ==
6].groupby('batting_team').size().reset_index(name='sixes')

# Merge the data
boundary_six_df = pd.merge(boundaries_df, sixes_df, on='batting_team',
how='outer').fillna(0)

# Display the data
print("\n Boundaries and Sixes by Team:")
print(boundary_six_df)
```

```
 Boundaries and Sixes by Team:
                   batting_team  boundaries  sixes
0           Chennai Super Kings        3196   1509
1               Deccan Chargers         957    400
2                Delhi Capitals        1352    550
3              Delhi Daredevils        2156    801
4                 Gujarat Lions         460    155
5                Gujarat Titans         691    271
6               Kings XI Punjab        2631   1075
7          Kochi Tuskers Kerala         170     53
8         Kolkata Knight Riders        3461   1495
9          Lucknow Super Giants         577    332
10               Mumbai Indians        3637   1685
11                Pune Warriors         525    196
12                 Punjab Kings         795    440
13             Rajasthan Royals        3091   1237
14       Rising Pune Supergiant         197     89
15      Rising Pune Supergiants         171     68
16  Royal Challengers Bangalore        3149   1488
17  Royal Challengers Bengaluru         229    165
18          Sunrisers Hyderabad        2405   1042
```

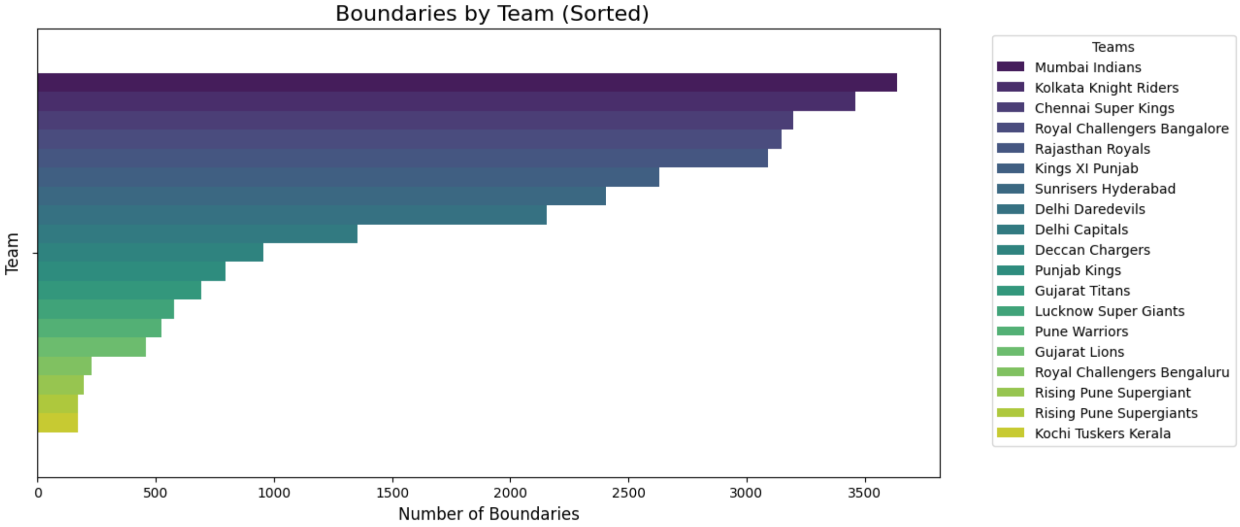
```
plt.figure(figsize=(12, 8))

sns.boxplot(hue='batting_team', y='run_rate', data=run_rate_df,
palette='coolwarm')

plt.title('Run Rates by Team', fontsize=16)
plt.xlabel('Team', fontsize=12)
plt.ylabel('Run Rate', fontsize=12)

plt.legend(title='Teams', bbox_to_anchor=(1.05, 1), loc='upper left')

# Display the plot
plt.show()
```

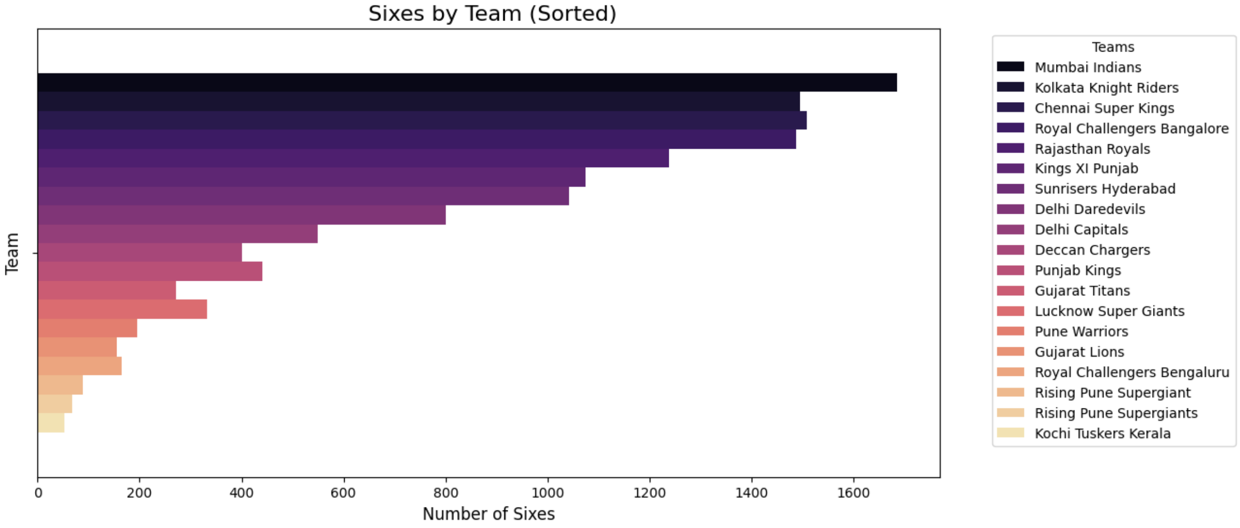


# Boundaries and Sixes Visualization

```
sorted_df = boundary_six_df.sort_values(by=['boundaries', 'sixes'],
ascending=[False, False])

plt.figure(figsize=(12, 6))
sns.barplot(x='boundaries', hue ='batting_team', data=sorted_df,
palette='viridis')

plt.title(' Boundaries by Team (Sorted)', fontsize=16)
plt.xlabel('Number of Boundaries', fontsize=12)
plt.ylabel('Team', fontsize=12)

plt.legend(title='Teams', bbox_to_anchor=(1.05, 1), loc='upper left')

plt.show()

plt.figure(figsize=(12, 6))
sns.barplot(x='sixes', hue ='batting_team', data=sorted_df,
palette='magma')
```

```
plt.title(' Sixes by Team (Sorted)', fontsize=16)
plt.xlabel('Number of Sixes', fontsize=12)
plt.ylabel('Team', fontsize=12)

# Move legend outside the plot
plt.legend(title='Teams', bbox_to_anchor=(1.05, 1), loc='upper left')

plt.show()
```





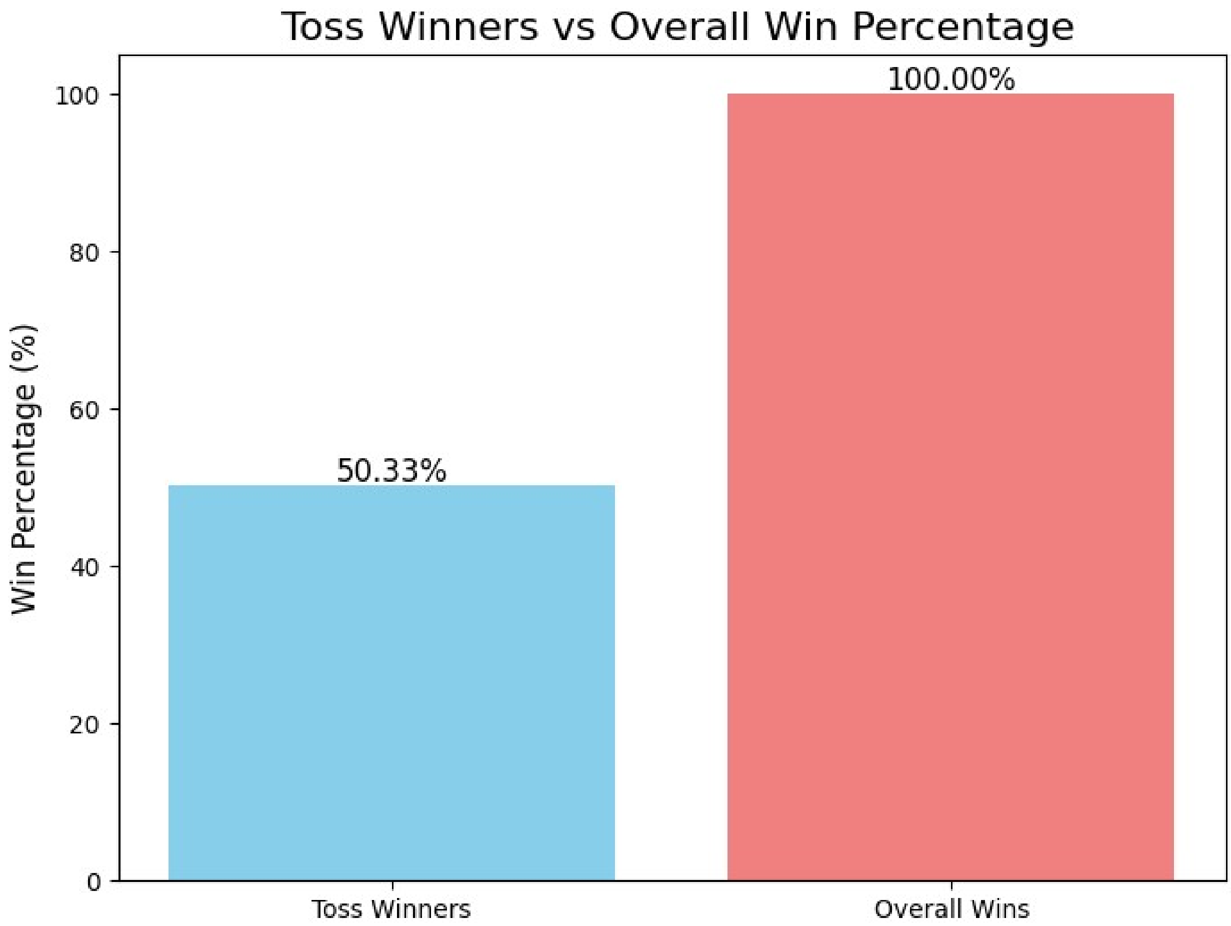
# lets check if Toss Winners Have a Higher Win Percentage

```
# Checking how many times the toss winner also won the match
toss_win = merged_df[merged_df['toss_winner'] == merged_df['winner']]
```

```python
# Calculating the win percentages
total_matches = len(merged_df)
toss_winner_matches = len(toss_win)
toss_win_percentage = (toss_winner_matches / total_matches) * 100

# Overall win percentage for reference
overall_win_percentage = (len(merged_df['winner'].dropna()) /
total_matches) * 100

# Display the results
print("\n Toss Winner Stats:")
print(f"Total Matches: {total_matches}")
print(f"Matches where Toss Winner also Won: {toss_winner_matches}")
print(f"Toss Winner Win Percentage: {toss_win_percentage:.2f}%")
print(f"Overall Win Percentage: {overall_win_percentage:.2f}%")
```

```
 Toss Winner Stats:
Total Matches: 260920
Matches where Toss Winner also Won: 131334
Toss Winner Win Percentage: 50.33%
Overall Win Percentage: 100.00%
```

```python
data = {'Toss Winners': toss_win_percentage,'Overall Wins':
overall_win_percentage}

# Plotting
plt.figure(figsize=(8, 6))
plt.bar(data.keys(), data.values(), color=['skyblue', 'lightcoral'])

# Labels
plt.title(' Toss Winners vs Overall Win Percentage', fontsize=16)
plt.ylabel('Win Percentage (%)', fontsize=12)

# Display values on top of the bars
for i, v in enumerate(data.values()):
    plt.text(i, v + 0.5, f"{v:.2f}%", ha='center', fontsize=12)

plt.show()
```



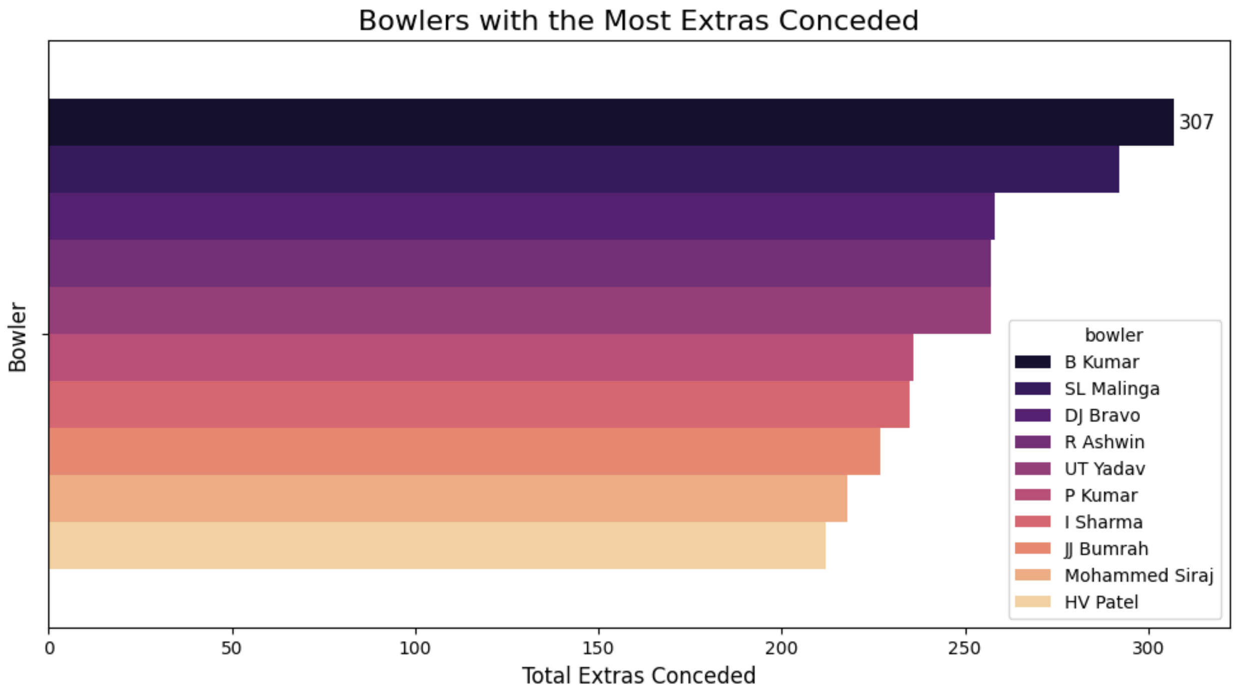
## Bowlers Who Conceded the Most Extras

```
# deliveries with extras
extras_df = merged_df[merged_df['extra_runs'] > 0]

# Group by bowler and sum the extras
bowler_extras = extras_df.groupby('bowler')
['extra_runs'].sum().reset_index()

# Sort by extras conceded
bowler_extras = bowler_extras.sort_values(by='extra_runs',
ascending=False)

# Display the bowlers with the most extras
print("\n Bowlers with the Most Extras Conceded:")
print(bowler_extras.head(10))
```

```
 Bowlers with the Most Extras Conceded:
             bowler  extra_runs
```

```
64           B Kumar         307
392       SL Malinga         292
104         DJ Bravo         258
322         R Ashwin         257
439         UT Yadav         257
304          P Kumar         236
148         I Sharma         235
173        JJ Bumrah         227
275  Mohammed Siraj          218
143         HV Patel         212
```

```
fig, ax = plt.subplots(figsize=(12, 6))

# Create the bar plot
bar_plot = sns.barplot(x='extra_runs', hue ='bowler',
data=top_bowlers, palette='magma', ax=ax)

plt.title('Bowlers with the Most Extras Conceded', fontsize=16)
plt.xlabel('Total Extras Conceded', fontsize=12)
plt.ylabel('Bowler', fontsize=12)

# Display values on top of the bars
ax.bar_label(bar_plot.containers[0], fmt='%d', label_type='edge',
fontsize=11, color='black', padding=3)

plt.show()
```



# Bowlers Who Dismissed the Same Batsmen the Most Times

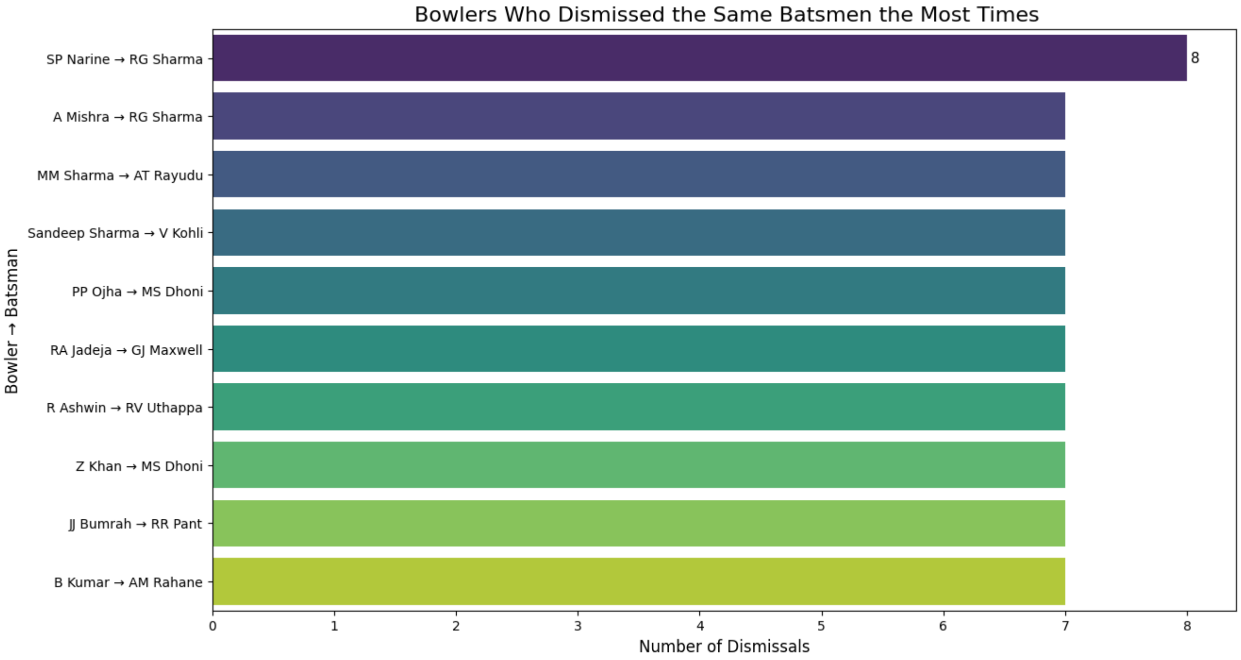
```python
# Filter for wicket deliveries
wickets_df = merged_df[merged_df['is_wicket'] == 1]

# Select relevant columns
wicket_details = wickets_df[['bowler', 'player_dismissed']]

# Group by bowler and batsman, then count occurrences
bowler_batsman_df = wicket_details.groupby(['bowler',
'player_dismissed']).size().reset_index(name='dismissals')

# Sort by the most dismissals
top_dismissals = bowler_batsman_df.sort_values('dismissals',
ascending=False).reset_index(drop=True)

# Display the top 10
print("\n Top 10 Bowler-Batsman Combinations:")
print(top_dismissals.head(10))
```

```
 Top 10 Bowler-Batsman Combinations:
           bowler player_dismissed  dismissals
0       SP Narine        RG Sharma           8
1        A Mishra        RG Sharma           7
2       MM Sharma        AT Rayudu           7
3  Sandeep Sharma          V Kohli           7
4         PP Ojha         MS Dhoni           7
5       RA Jadeja       GJ Maxwell           7
6        R Ashwin       RV Uthappa           7
7          Z Khan         MS Dhoni           7
8       JJ Bumrah          RR Pant           7
9         B Kumar        AM Rahane           7
```

```python
top_10_bowler_batsman = top_dismissals.head(10)

plt.figure(figsize=(14, 8))

ax = sns.barplot(x='dismissals', y=top_10_bowler_batsman['bowler'] + '
→ ' + top_10_bowler_batsman['player_dismissed'],
                 data=top_10_bowler_batsman, palette='viridis')

# Labels and Title
plt.title(' Bowlers Who Dismissed the Same Batsmen the Most Times',
fontsize=16)
plt.xlabel('Number of Dismissals', fontsize=12)
plt.ylabel('Bowler → Batsman', fontsize=12)
```

```
# Display values on top of the bars
ax.bar_label(ax.containers[0], fmt='%d', label_type='edge',
fontsize=11, color='black', padding=3)

plt.show()
```

```
C:\Users\Abhishek upadhyay\AppData\Local\Temp\
ipykernel_13720\2942248401.py:5: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `y` variable to `hue` and set
`legend=False` for the same effect.

  ax = sns.barplot(x='dismissals', y=top_10_bowler_batsman['bowler'] +
' → ' + top_10_bowler_batsman['player_dismissed'],
```



# Which Stadiums Favor Specific Teams

```
# Count the number of wins by stadium and team
stadium_wins = merged_df.groupby(['venue',
'winner']).size().reset_index(name='wins')

# Find the team with the most wins per stadium
most_wins_per_stadium = stadium_wins.loc[stadium_wins.groupby('venue')
['wins'].idxmax()].reset_index(drop=True)

# Sort by stadium name
most_wins_per_stadium = most_wins_per_stadium.sort_values('venue')
```

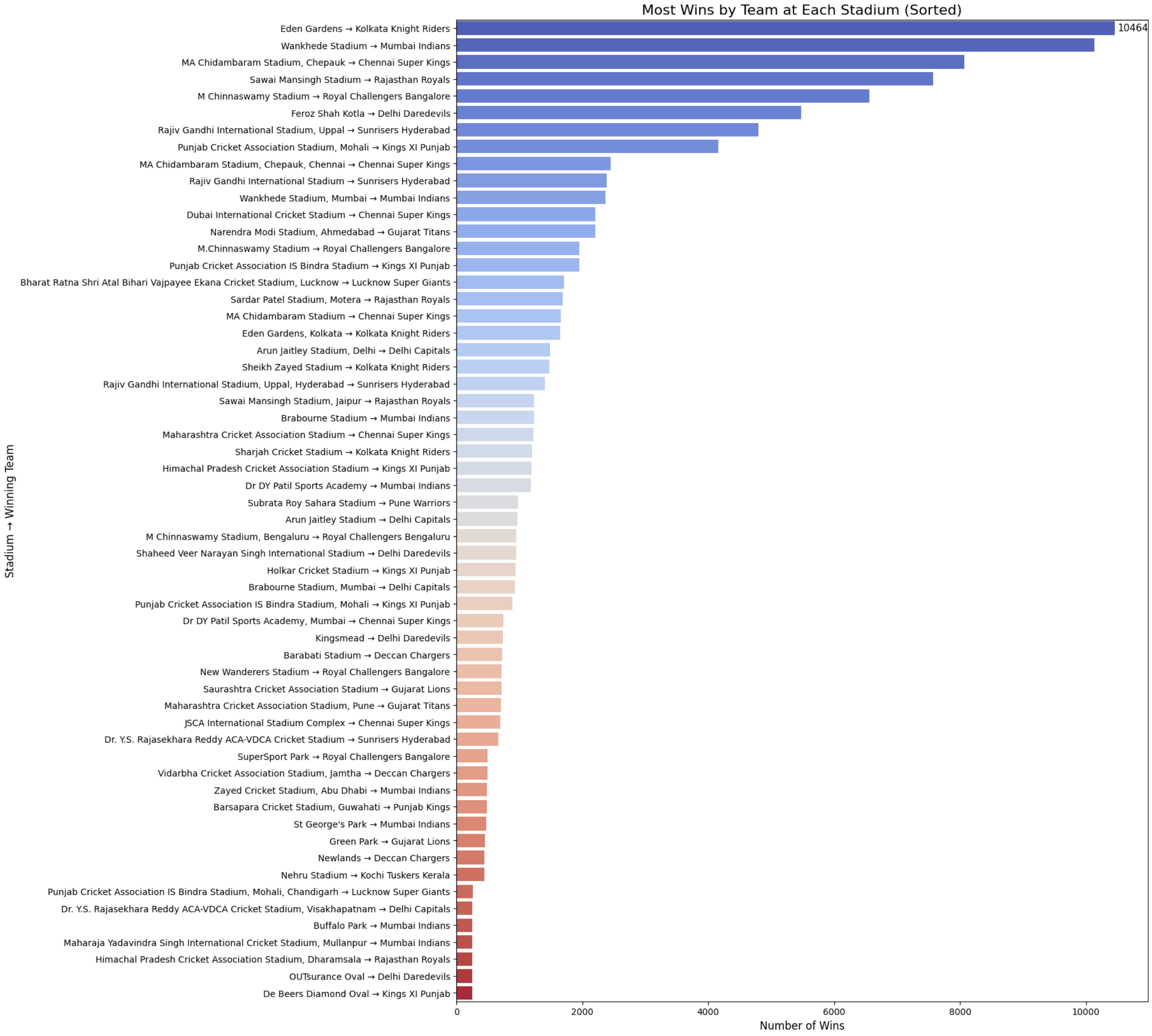
```python
# Add a new column combining stadium and team name
most_wins_per_stadium['stadium_team'] = most_wins_per_stadium['venue']
+ ' → ' + most_wins_per_stadium['winner']

# Display the results
print("\n Teams with Most Wins at Each Stadium:")
print(most_wins_per_stadium[['stadium_team', 'wins']])
```

```
 Teams with Most Wins at Each Stadium:
                                         stadium_team   wins
0               Arun Jaitley Stadium → Delhi Capitals    973
1        Arun Jaitley Stadium, Delhi → Delhi Capitals   1486
2                  Barabati Stadium → Deccan Chargers    731
3   Barsapara Cricket Stadium, Guwahati → Punjab K...    487
4   Bharat Ratna Shri Atal Bihari Vajpayee Ekana C...   1714
5                  Brabourne Stadium → Mumbai Indians   1231
6          Brabourne Stadium, Mumbai → Delhi Capitals    928
7                       Buffalo Park → Mumbai Indians    253
8             De Beers Diamond Oval → Kings XI Punjab    247
9         Dr DY Patil Sports Academy → Mumbai Indians   1182
10  Dr DY Patil Sports Academy, Mumbai → Chennai S...    745
11  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...    666
12  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...    256
13  Dubai International Cricket Stadium → Chennai ...   2204
14              Eden Gardens → Kolkata Knight Riders  10464
15      Eden Gardens, Kolkata → Kolkata Knight Riders   1648
16                Feroz Shah Kotla → Delhi Daredevils   5477
17                         Green Park → Gujarat Lions    450
18  Himachal Pradesh Cricket Association Stadium →...   1191
19  Himachal Pradesh Cricket Association Stadium, ...    252
20           Holkar Cricket Stadium → Kings XI Punjab    942
21  JSCA International Stadium Complex → Chennai S...    699
22                       Kingsmead → Delhi Daredevils    735
23  M Chinnaswamy Stadium → Royal Challengers Bang...   6564
24  M Chinnaswamy Stadium, Bengaluru → Royal Chall...    952
25  M.Chinnaswamy Stadium → Royal Challengers Bang...   1957
26        MA Chidambaram Stadium → Chennai Super Kings   1658
27  MA Chidambaram Stadium, Chepauk → Chennai Supe...   8068
28  MA Chidambaram Stadium, Chepauk, Chennai → Che...   2454
29  Maharaja Yadavindra Singh International Cricke...    252
30  Maharashtra Cricket Association Stadium → Chen...   1220
31  Maharashtra Cricket Association Stadium, Pune ...    705
32  Narendra Modi Stadium, Ahmedabad → Gujarat Titans   2204
33               Nehru Stadium → Kochi Tuskers Kerala    443
34  New Wanderers Stadium → Royal Challengers Bang...    715
35                         Newlands → Deccan Chargers    446
36                 OUTsurance Oval → Delhi Daredevils    251
37  Punjab Cricket Association IS Bindra Stadium →...   1953
```

```
38  Punjab Cricket Association IS Bindra Stadium, ...    887
39  Punjab Cricket Association IS Bindra Stadium, ...    257
40  Punjab Cricket Association Stadium, Mohali → K...   4158
41  Rajiv Gandhi International Stadium → Sunrisers...   2393
42  Rajiv Gandhi International Stadium, Uppal → Su...   4798
43  Rajiv Gandhi International Stadium, Uppal, Hyd...   1406
44    Sardar Patel Stadium, Motera → Rajasthan Royals   1687
45  Saurashtra Cricket Association Stadium → Gujar...    715
46          Sawai Mansingh Stadium → Rajasthan Royals   7578
47  Sawai Mansingh Stadium, Jaipur → Rajasthan Royals   1233
48  Shaheed Veer Narayan Singh International Stadi...    951
49    Sharjah Cricket Stadium → Kolkata Knight Riders   1203
50       Sheikh Zayed Stadium → Kolkata Knight Riders   1473
51                  St George's Park → Mumbai Indians    474
52         Subrata Roy Sahara Stadium → Pune Warriors    980
53      SuperSport Park → Royal Challengers Bangalore    495
54  Vidarbha Cricket Association Stadium, Jamtha →...    493
55                  Wankhede Stadium → Mumbai Indians  10132
56          Wankhede Stadium, Mumbai → Mumbai Indians   2365
57  Zayed Cricket Stadium, Abu Dhabi → Mumbai Indians    488
```

```python
most_wins_per_stadium = most_wins_per_stadium.sort_values('wins',
ascending=False)

plt.figure(figsize=(14, 20))

ax = sns.barplot(x='wins', y='stadium_team',
data=most_wins_per_stadium, palette='coolwarm')

# Labels and Title
plt.title('Most Wins by Team at Each Stadium (Sorted)', fontsize=16)
plt.xlabel('Number of Wins', fontsize=12)
plt.ylabel('Stadium → Winning Team', fontsize=12)

# Display values on top of the bars
ax.bar_label(ax.containers[0], fmt='%d', label_type='edge',
fontsize=11, color='black', padding=3)

plt.show()
```

```
C:\Users\Abhishek upadhyay\AppData\Local\Temp\
ipykernel_13720\1660244040.py:5: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `y` variable to `hue` and set
`legend=False` for the same effect.

  ax = sns.barplot(x='wins', y='stadium_team',
data=most_wins_per_stadium, palette='coolwarm')
```



# Most Wickets at Each Stadium by Bowler

```
wicket_df = merged_df[merged_df['is_wicket'] == 1]
stadium_wickets = wicket_df.groupby(['venue',
'bowler']).size().reset_index(name='wickets')

most_wickets_per_stadium =
stadium_wickets.loc[stadium_wickets.groupby('venue')
['wickets'].idxmax()].reset_index(drop=True)

# Sort by stadium name
most_wickets_per_stadium =
most_wickets_per_stadium.sort_values('venue')

# Add a combined name column for better visualization
```

```python
most_wickets_per_stadium['stadium_bowler'] =
most_wickets_per_stadium['venue'] + ' → ' +
most_wickets_per_stadium['bowler']

# Display the results
print("\n Bowlers with Most Wickets at Each Stadium:")
print(most_wickets_per_stadium)
```

```
 Bowlers with Most Wickets at Each Stadium:
                                                venue           bowler
\
0                                Arun Jaitley Stadium         A Mishra

1                         Arun Jaitley Stadium, Delhi     Mukesh Kumar

2                                    Barabati Stadium        SP Narine

3                 Barsapara Cricket Stadium, Guwahati        YS Chahal

4   Bharat Ratna Shri Atal Bihari Vajpayee Ekana C...     Ravi Bishnoi

5                                   Brabourne Stadium           Z Khan

6                           Brabourne Stadium, Mumbai         KK Ahmed

7                                        Buffalo Park         R Bhatia

8                               De Beers Diamond Oval        RG Sharma

9                          Dr DY Patil Sports Academy     DE Bollinger

10                 Dr DY Patil Sports Academy, Mumbai        JJ Bumrah

11  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...          A Zampa

12  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...         A Nortje

13                Dubai International Cricket Stadium         K Rabada

14                                       Eden Gardens        SP Narine

15                              Eden Gardens, Kolkata         CV Varun

16                                   Feroz Shah Kotla         A Mishra

17                                         Green Park         DR Smith

18       Himachal Pradesh Cricket Association Stadium        PP Chawla

19  Himachal Pradesh Cricket Association Stadium, ...         HV Patel
```

```
20                             Holkar Cricket Stadium            AJ Tye
21                   JSCA International Stadium Complex         RA Jadeja
22                                            Kingsmead         IK Pathan
23                               M Chinnaswamy Stadium         YS Chahal
24                    M Chinnaswamy Stadium, Bengaluru   Mohammed Siraj
25                               M.Chinnaswamy Stadium         YS Chahal
26                              MA Chidambaram Stadium  Harbhajan Singh
27                    MA Chidambaram Stadium, Chepauk          R Ashwin
28           MA Chidambaram Stadium, Chepauk, Chennai      TU Deshpande
29  Maharaja Yadavindra Singh International Cricke...          HV Patel
30            Maharashtra Cricket Association Stadium       Imran Tahir
31      Maharashtra Cricket Association Stadium, Pune          HV Patel
32                    Narendra Modi Stadium, Ahmedabad         MM Sharma
33                                       Nehru Stadium    R Vinay Kumar
34                              New Wanderers Stadium          A Kumble
35                                            Newlands       Kamran Khan
36                                     OUTsurance Oval       MF Maharoof
37     Punjab Cricket Association IS Bindra Stadium   Mohammed Shami
38  Punjab Cricket Association IS Bindra Stadium, ...   Sandeep Sharma
39  Punjab Cricket Association IS Bindra Stadium, ...   Arshdeep Singh
40          Punjab Cricket Association Stadium, Mohali         PP Chawla
41                Rajiv Gandhi International Stadium       Rashid Khan
42         Rajiv Gandhi International Stadium, Uppal          A Mishra
43  Rajiv Gandhi International Stadium, Uppal, Hyd...       T Natarajan
44                        Sardar Patel Stadium, Motera          PV Tambe
45             Saurashtra Cricket Association Stadium            AJ Tye
```

```
46                            Sawai Mansingh Stadium        SK Trivedi
47                    Sawai Mansingh Stadium, Jaipur         YS Chahal
48   Shaheed Veer Narayan Singh International Stadium     CR Brathwaite
49                           Sharjah Cricket Stadium    Mohammed Shami
50                              Sheikh Zayed Stadium         JJ Bumrah
51                                  St George's Park        SL Malinga
52                        Subrata Roy Sahara Stadium          R Sharma
53                                   SuperSport Park          RP Singh
54      Vidarbha Cricket Association Stadium, Jamtha         RJ Harris
55                                  Wankhede Stadium        SL Malinga
56                          Wankhede Stadium, Mumbai         JJ Bumrah
57                  Zayed Cricket Stadium, Abu Dhabi         JJ Bumrah
```

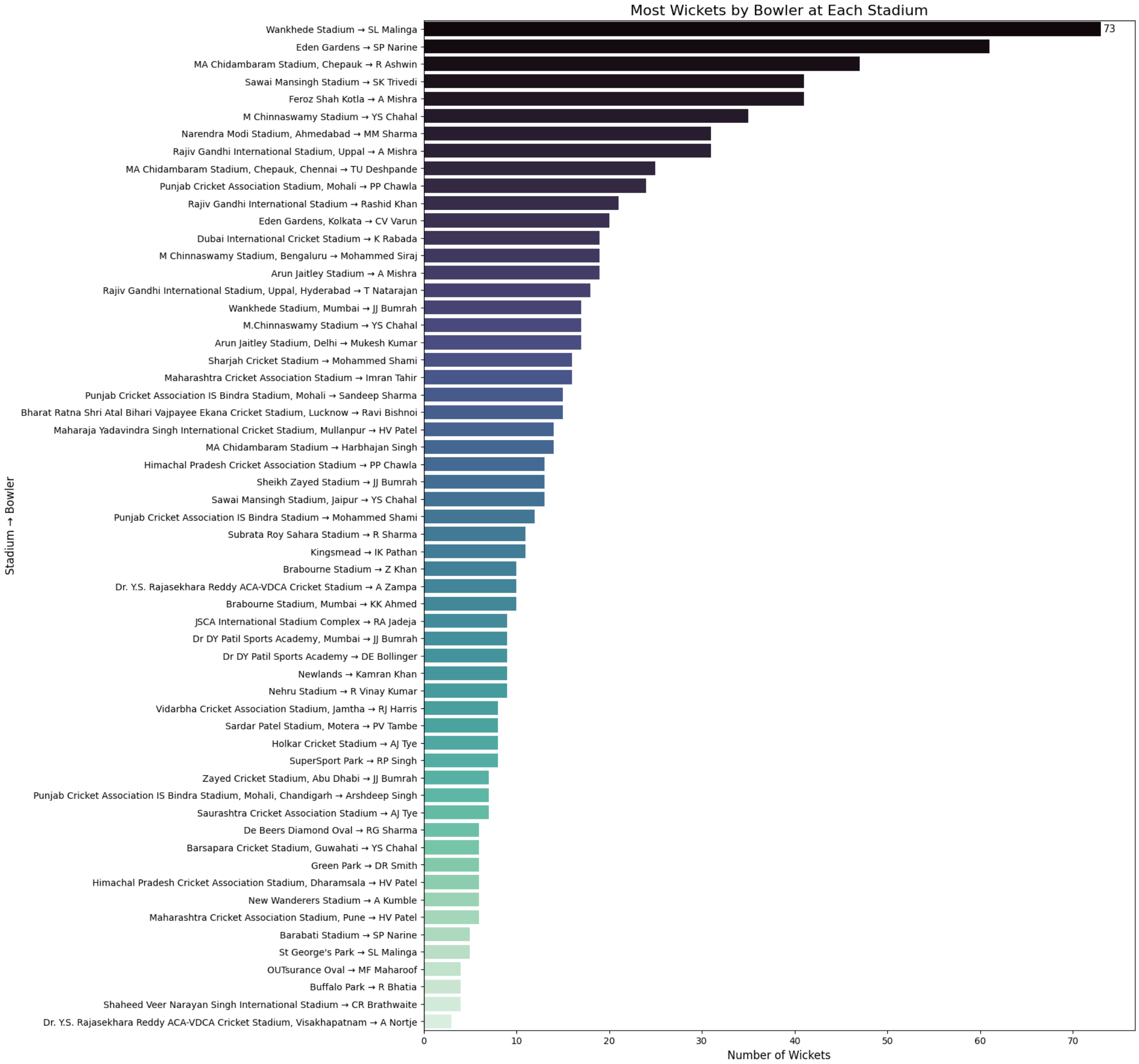
```
    wickets                                     stadium_bowler
0        19                    Arun Jaitley Stadium → A Mishra
1        17         Arun Jaitley Stadium, Delhi → Mukesh Kumar
2         5                       Barabati Stadium → SP Narine
3         6    Barsapara Cricket Stadium, Guwahati → YS Chahal
4        15  Bharat Ratna Shri Atal Bihari Vajpayee Ekana C...
5        10                         Brabourne Stadium → Z Khan
6        10               Brabourne Stadium, Mumbai → KK Ahmed
7         4                            Buffalo Park → R Bhatia
8         6                  De Beers Diamond Oval → RG Sharma
9         9          Dr DY Patil Sports Academy → DE Bollinger
10        9     Dr DY Patil Sports Academy, Mumbai → JJ Bumrah
11       10  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...
12        3  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...
13       19     Dubai International Cricket Stadium → K Rabada
14       61                           Eden Gardens → SP Narine
15       20                   Eden Gardens, Kolkata → CV Varun
16       41                        Feroz Shah Kotla → A Mishra
17        6                              Green Park → DR Smith
18       13  Himachal Pradesh Cricket Association Stadium →...
19        6  Himachal Pradesh Cricket Association Stadium, ...
20        8                    Holkar Cricket Stadium → AJ Tye
21        9     JSCA International Stadium Complex → RA Jadeja
22       11                              Kingsmead → IK Pathan
23       35                  M Chinnaswamy Stadium → YS Chahal
```

```
24       19  M Chinnaswamy Stadium, Bengaluru → Mohammed Siraj
25       17                  M.Chinnaswamy Stadium → YS Chahal
26       14           MA Chidambaram Stadium → Harbhajan Singh
27       47         MA Chidambaram Stadium, Chepauk → R Ashwin
28       25  MA Chidambaram Stadium, Chepauk, Chennai → TU ...
29       14  Maharaja Yadavindra Singh International Cricke...
30       16  Maharashtra Cricket Association Stadium → Imra...
31        6  Maharashtra Cricket Association Stadium, Pune ...
32       31       Narendra Modi Stadium, Ahmedabad → MM Sharma
33        9                      Nehru Stadium → R Vinay Kumar
34        6                   New Wanderers Stadium → A Kumble
35        9                             Newlands → Kamran Khan
36        4                      OUTsurance Oval → MF Maharoof
37       12  Punjab Cricket Association IS Bindra Stadium →...
38       15  Punjab Cricket Association IS Bindra Stadium, ...
39        7  Punjab Cricket Association IS Bindra Stadium, ...
40       24  Punjab Cricket Association Stadium, Mohali → P...
41       21   Rajiv Gandhi International Stadium → Rashid Khan
42       31  Rajiv Gandhi International Stadium, Uppal → A ...
43       18  Rajiv Gandhi International Stadium, Uppal, Hyd...
44        8            Sardar Patel Stadium, Motera → PV Tambe
45        7    Saurashtra Cricket Association Stadium → AJ Tye
46       41                Sawai Mansingh Stadium → SK Trivedi
47       13         Sawai Mansingh Stadium, Jaipur → YS Chahal
48        4  Shaheed Veer Narayan Singh International Stadi...
49       16           Sharjah Cricket Stadium → Mohammed Shami
50       13                   Sheikh Zayed Stadium → JJ Bumrah
51        5                      St George's Park → SL Malinga
52       11              Subrata Roy Sahara Stadium → R Sharma
53        8                         SuperSport Park → RP Singh
54        8  Vidarbha Cricket Association Stadium, Jamtha →...
55       73                      Wankhede Stadium → SL Malinga
56       17               Wankhede Stadium, Mumbai → JJ Bumrah
57        7       Zayed Cricket Stadium, Abu Dhabi → JJ Bumrah
```

```
# Sort by wickets in descending order
most_wickets_per_stadium =
most_wickets_per_stadium.sort_values('wickets', ascending=False)

# Plotting
plt.figure(figsize=(14, 20))

# Barplot
ax = sns.barplot(x='wickets', y='stadium_bowler',
data=most_wickets_per_stadium, palette='mako')

# Labels and Title
plt.title('Most Wickets by Bowler at Each Stadium', fontsize=16)
plt.xlabel('Number of Wickets', fontsize=12)
plt.ylabel('Stadium → Bowler', fontsize=12)
```

```
# Display values on top of the bars
ax.bar_label(ax.containers[0], fmt='%d', label_type='edge',
fontsize=11, color='black', padding=3)

plt.show()
```

```
C:\Users\Abhishek upadhyay\AppData\Local\Temp\
ipykernel_13720\4143042734.py:8: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `y` variable to `hue` and set
`legend=False` for the same effect.

  ax = sns.barplot(x='wickets', y='stadium_bowler',
data=most_wickets_per_stadium, palette='mako')
```



# Most Runs Scored by Batsmen at Each Stadium

```
# Group by stadium and batsman, summing the total runs
stadium_batsmen_runs = merged_df.groupby(['venue', 'batter'])
['batsman_runs'].sum().reset_index(name='runs_scored')

# Find the batsman with the most runs at each stadium
most_runs_by_batsman =
stadium_batsmen_runs.loc[stadium_batsmen_runs.groupby('venue')
['runs_scored'].idxmax()].reset_index(drop=True)

# Sort by stadium name
most_runs_by_batsman = most_runs_by_batsman.sort_values('venue')
```

```
# Add a combined column for better visualization
most_runs_by_batsman['stadium_batsman'] =
most_runs_by_batsman['venue'] + ' → ' + most_runs_by_batsman['batter']

# Display the results
print("\n Batsmen with the Most Runs at Each Stadium:")
print(most_runs_by_batsman)
```

```
 Batsmen with the Most Runs at Each Stadium:
                                                venue
batter  \
0                                Arun Jaitley Stadium           SS
Iyer
1                         Arun Jaitley Stadium, Delhi         DA
Warner
2                                    Barabati Stadium        RV
Uthappa
3                  Barsapara Cricket Stadium, Guwahati        JC
Buttler
4   Bharat Ratna Shri Atal Bihari Vajpayee Ekana C...          KL
Rahul
5                                   Brabourne Stadium         SS
Tiwary
6                           Brabourne Stadium, Mumbai         DA
Warner
7                                        Buffalo Park          BJ
Hodge
8                               De Beers Diamond Oval         A
Symonds
9                          Dr DY Patil Sports Academy        RV
Uthappa
10                 Dr DY Patil Sports Academy, Mumbai        JC
Buttler
11  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...          S
Dhawan
12  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...           RR
Pant
13                Dubai International Cricket Stadium          KL
Rahul
14                                       Eden Gardens         G
Gambhir
15                              Eden Gardens, Kolkata          RK
Singh
16                                   Feroz Shah Kotla          V
Sehwag
17                                         Green Park          SK
Raina
18       Himachal Pradesh Cricket Association Stadium          SE
```

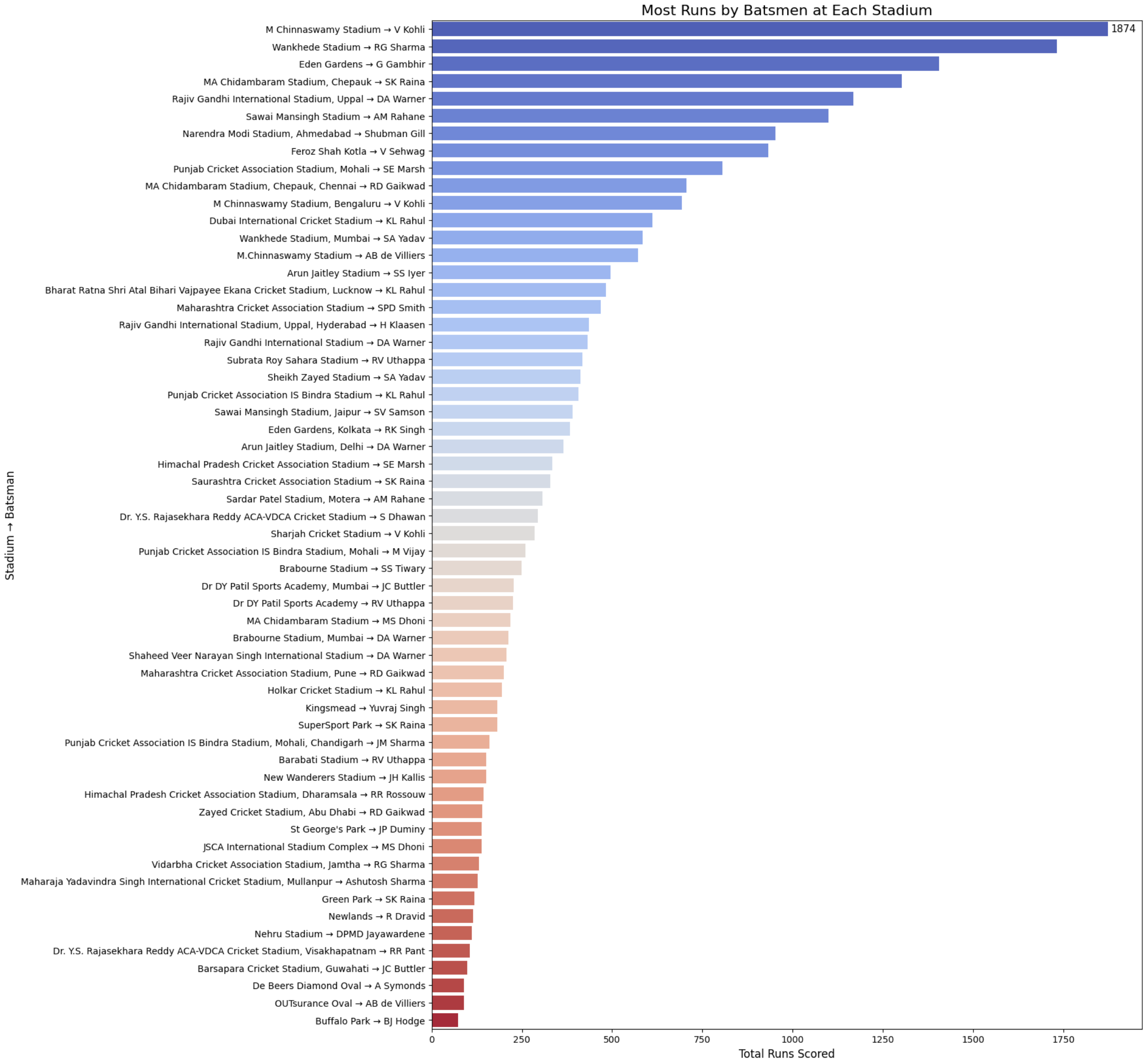
```
Marsh
19  Himachal Pradesh Cricket Association Stadium, ...        RR
Rossouw
20                             Holkar Cricket Stadium          KL
Rahul
21                 JSCA International Stadium Complex          MS
Dhoni
22                                          Kingsmead      Yuvraj
Singh
23                              M Chinnaswamy Stadium           V
Kohli
24                   M Chinnaswamy Stadium, Bengaluru           V
Kohli
25                              M.Chinnaswamy Stadium    AB de
Villiers
26                             MA Chidambaram Stadium          MS
Dhoni
27                    MA Chidambaram Stadium, Chepauk          SK
Raina
28           MA Chidambaram Stadium, Chepauk, Chennai        RD
Gaikwad
29  Maharaja Yadavindra Singh International Cricke...   Ashutosh
Sharma
30            Maharashtra Cricket Association Stadium         SPD
Smith
31      Maharashtra Cricket Association Stadium, Pune        RD
Gaikwad
32                   Narendra Modi Stadium, Ahmedabad      Shubman
Gill
33                                      Nehru Stadium  DPMD
Jayawardene
34                              New Wanderers Stadium         JH
Kallis
35                                           Newlands          R
Dravid
36                                    OUTsurance Oval    AB de
Villiers
37       Punjab Cricket Association IS Bindra Stadium          KL
Rahul
38  Punjab Cricket Association IS Bindra Stadium, ...           M
Vijay
39  Punjab Cricket Association IS Bindra Stadium, ...         JM
Sharma
40         Punjab Cricket Association Stadium, Mohali          SE
Marsh
41                 Rajiv Gandhi International Stadium         DA
Warner
42          Rajiv Gandhi International Stadium, Uppal         DA
Warner
```

```
43  Rajiv Gandhi International Stadium, Uppal, Hyd...         H
Klaasen
44                       Sardar Patel Stadium, Motera         AM
Rahane
45             Saurashtra Cricket Association Stadium          SK
Raina
46                             Sawai Mansingh Stadium         AM
Rahane
47                     Sawai Mansingh Stadium, Jaipur         SV
Samson
48   Shaheed Veer Narayan Singh International Stadium         DA
Warner
49                            Sharjah Cricket Stadium           V
Kohli
50                               Sheikh Zayed Stadium          SA
Yadav
51                                   St George's Park         JP
Duminy
52                         Subrata Roy Sahara Stadium        RV
Uthappa
53                                    SuperSport Park          SK
Raina
54       Vidarbha Cricket Association Stadium, Jamtha         RG
Sharma
55                                   Wankhede Stadium         RG
Sharma
56                           Wankhede Stadium, Mumbai          SA
Yadav
57                   Zayed Cricket Stadium, Abu Dhabi        RD
Gaikwad

    runs_scored                                    stadium_batsman
0           496                     Arun Jaitley Stadium → SS Iyer
1           365            Arun Jaitley Stadium, Delhi → DA Warner
2           152                      Barabati Stadium → RV Uthappa
3            98   Barsapara Cricket Stadium, Guwahati → JC Buttler
4           483  Bharat Ratna Shri Atal Bihari Vajpayee Ekana C...
5           249                      Brabourne Stadium → SS Tiwary
6           213              Brabourne Stadium, Mumbai → DA Warner
7            73                            Buffalo Park → BJ Hodge
8            90                  De Beers Diamond Oval → A Symonds
9           226            Dr DY Patil Sports Academy → RV Uthappa
10          228    Dr DY Patil Sports Academy, Mumbai → JC Buttler
11          294  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...
12          106  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...
13          612     Dubai International Cricket Stadium → KL Rahul
14         1407                           Eden Gardens → G Gambhir
15          383                   Eden Gardens, Kolkata → RK Singh
16          933                        Feroz Shah Kotla → V Sehwag
```

```
17          119                              Green Park → SK Raina
18          334  Himachal Pradesh Cricket Association Stadium →...
19          143  Himachal Pradesh Cricket Association Stadium, ...
20          195                  Holkar Cricket Stadium → KL Rahul
21          138      JSCA International Stadium Complex → MS Dhoni
22          182                           Kingsmead → Yuvraj Singh
23         1874                    M Chinnaswamy Stadium → V Kohli
24          694         M Chinnaswamy Stadium, Bengaluru → V Kohli
25          572             M.Chinnaswamy Stadium → AB de Villiers
26          218                  MA Chidambaram Stadium → MS Dhoni
27         1302         MA Chidambaram Stadium, Chepauk → SK Raina
28          706  MA Chidambaram Stadium, Chepauk, Chennai → RD ...
29          128  Maharaja Yadavindra Singh International Cricke...
30          469  Maharashtra Cricket Association Stadium → SPD ...
31          200  Maharashtra Cricket Association Stadium, Pune ...
32          953    Narendra Modi Stadium, Ahmedabad → Shubman Gill
33          111                   Nehru Stadium → DPMD Jayawardene
34          151                  New Wanderers Stadium → JH Kallis
35          114                                Newlands → R Dravid
36           90                   OUTsurance Oval → AB de Villiers
37          406  Punjab Cricket Association IS Bindra Stadium →...
38          260  Punjab Cricket Association IS Bindra Stadium, ...
39          160  Punjab Cricket Association IS Bindra Stadium, ...
40          806  Punjab Cricket Association Stadium, Mohali → S...
41          433     Rajiv Gandhi International Stadium → DA Warner
42         1169  Rajiv Gandhi International Stadium, Uppal → DA...
43          435  Rajiv Gandhi International Stadium, Uppal, Hyd...
44          308           Sardar Patel Stadium, Motera → AM Rahane
45          328  Saurashtra Cricket Association Stadium → SK Raina
46         1100                 Sawai Mansingh Stadium → AM Rahane
47          391         Sawai Mansingh Stadium, Jaipur → SV Samson
48          207  Shaheed Veer Narayan Singh International Stadi...
49          285                  Sharjah Cricket Stadium → V Kohli
50          413                    Sheikh Zayed Stadium → SA Yadav
51          139                       St George's Park → JP Duminy
52          418            Subrata Roy Sahara Stadium → RV Uthappa
53          182                         SuperSport Park → SK Raina
54          132  Vidarbha Cricket Association Stadium, Jamtha →...
55         1733                       Wankhede Stadium → RG Sharma
56          584                Wankhede Stadium, Mumbai → SA Yadav
57          141      Zayed Cricket Stadium, Abu Dhabi → RD Gaikwad
```

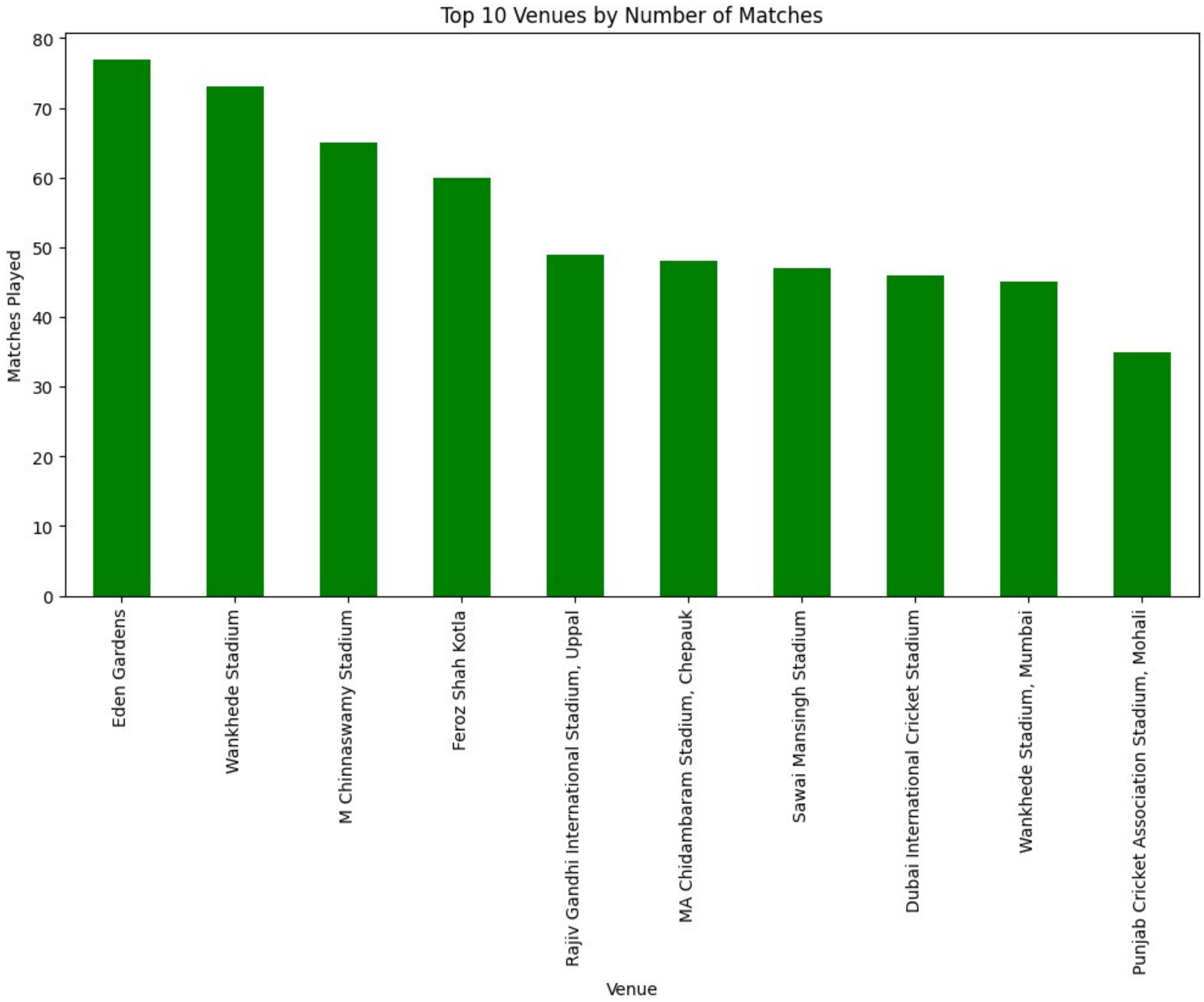
```
most_runs_by_batsman = most_runs_by_batsman.sort_values('runs_scored',
ascending=False)

# Plotting
plt.figure(figsize=(14, 20))

# Barplot
ax = sns.barplot(x='runs_scored', y='stadium_batsman',
data=most_runs_by_batsman, palette='coolwarm')

# Labels and Title
plt.title('Most Runs by Batsmen at Each Stadium', fontsize=16)
plt.xlabel('Total Runs Scored', fontsize=12)
plt.ylabel('Stadium → Batsman', fontsize=12)

# Display values on top of the bars
ax.bar_label(ax.containers[0], fmt='%d', label_type='edge',
fontsize=11, color='black', padding=3)

plt.show()
```

```
C:\Users\Abhishek upadhyay\AppData\Local\Temp\
ipykernel_13720\3752376805.py:7: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `y` variable to `hue` and set
`legend=False` for the same effect.

  ax = sns.barplot(x='runs_scored', y='stadium_batsman',
data=most_runs_by_batsman, palette='coolwarm')
```



# Top 10 Venues by number of matches

```
venue_counts = matches['venue'].value_counts().head(10)

plt.figure(figsize=(12, 6))
venue_counts.plot(kind='bar', color='green')
plt.title('Top 10 Venues by Number of Matches')
plt.xlabel('Venue')
plt.ylabel('Matches Played')

plt.show()
```



# umpire in most number of matches top 10

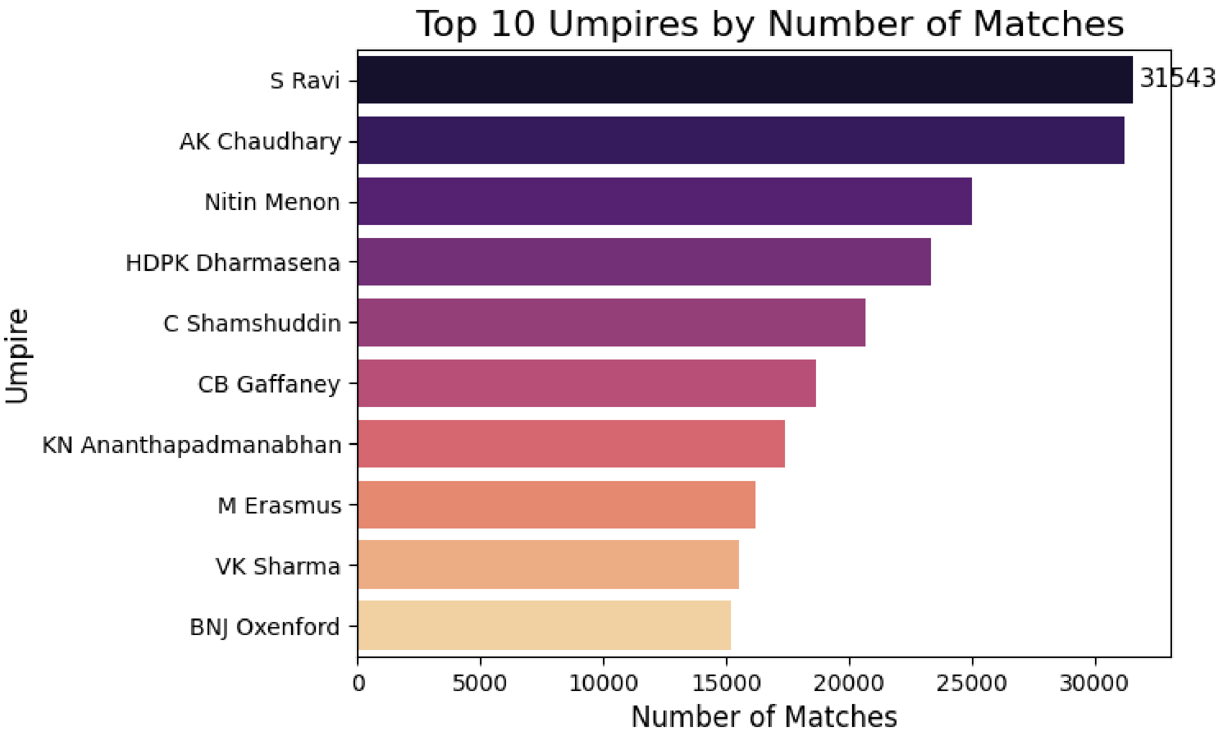
```
umpire_counts = pd.concat([merged_df['umpire1'],
merged_df['umpire2']]).value_counts().reset_index()

umpire_counts.columns = ['umpire', 'matches']

top_10_umpires = umpire_counts.head(10)

print("\n Top 10 Umpires by Number of Matches:")
print(top_10_umpires)
```

```
 Top 10 Umpires by Number of Matches:
                  umpire  matches
0                 S Ravi    31543
1           AK Chaudhary    31248
```

```
2             Nitin Menon    24985
3         HDPK Dharmasena    23332
4           C Shamshuddin    20701
5             CB Gaffaney    18644
6  KN Ananthapadmanabhan    17394
7               M Erasmus    16230
8               VK Sharma    15508
9            BNJ Oxenford    15187
```

```
ax = sns.barplot(x='matches', y='umpire', data=top_10_umpires,
palette='magma')

plt.title(' Top 10 Umpires by Number of Matches', fontsize=16)
plt.xlabel('Number of Matches', fontsize=12)
plt.ylabel('Umpire', fontsize=12)

ax.bar_label(ax.containers[0], fmt='%d', label_type='edge',
fontsize=11, color='black', padding=3)

plt.show()
```

```
C:\Users\Abhishek upadhyay\AppData\Local\Temp\
ipykernel_13720\3960461099.py:1: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `y` variable to `hue` and set
`legend=False` for the same effect.

  ax = sns.barplot(x='matches', y='umpire', data=top_10_umpires,
palette='magma')
```

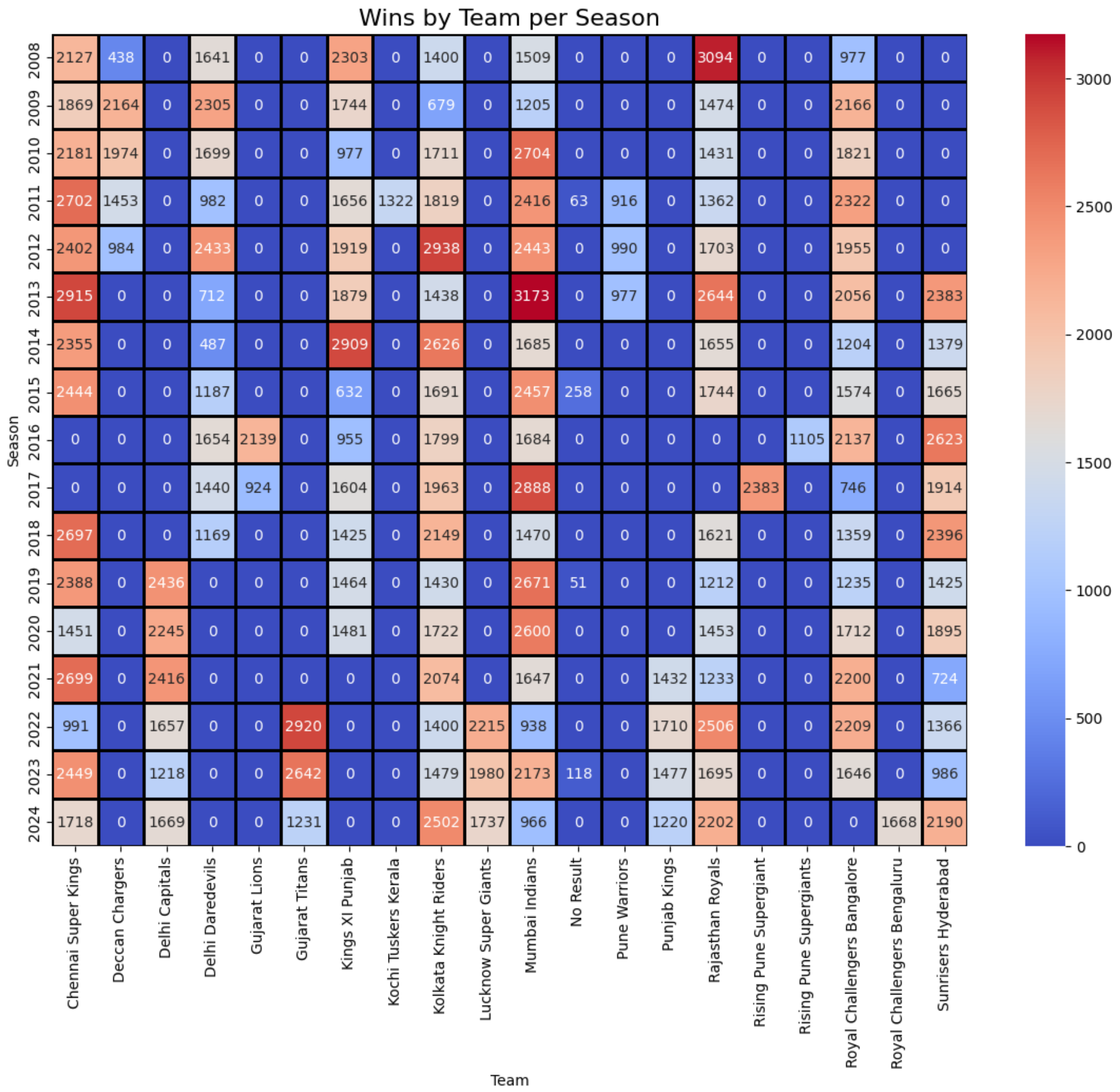


```
merged_df.head()

   match_id  inning           batting_team
bowling_team  over  \
0    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
1    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
2    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
3    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0
4    335982       1  Kolkata Knight Riders  Royal Challengers
Bangalore     0

   ball       batter   bowler  non_striker  batsman_runs  ...
toss_decision  \
0     1   SC Ganguly  P Kumar  BB McCullum             0  ...
field
1     2  BB McCullum  P Kumar   SC Ganguly             0  ...
field
2     3  BB McCullum  P Kumar   SC Ganguly             0  ...
field
3     4  BB McCullum  P Kumar   SC Ganguly             0  ...
field
4     5  BB McCullum  P Kumar   SC Ganguly             0  ...
field
```

```
                  winner result  result_margin target_runs
target_overs  \
0  Kolkata Knight Riders    runs          140.0       223.0
20.0
1  Kolkata Knight Riders    runs          140.0       223.0
20.0
2  Kolkata Knight Riders    runs          140.0       223.0
20.0
3  Kolkata Knight Riders    runs          140.0       223.0
20.0
4  Kolkata Knight Riders    runs          140.0       223.0
20.0

  super_over  method    umpire1      umpire2
0          N    20.0  Asad Rauf  RE Koertzen
1          N    20.0  Asad Rauf  RE Koertzen
2          N    20.0  Asad Rauf  RE Koertzen
3          N    20.0  Asad Rauf  RE Koertzen
4          N    20.0  Asad Rauf  RE Koertzen

[5 rows x 37 columns]
```

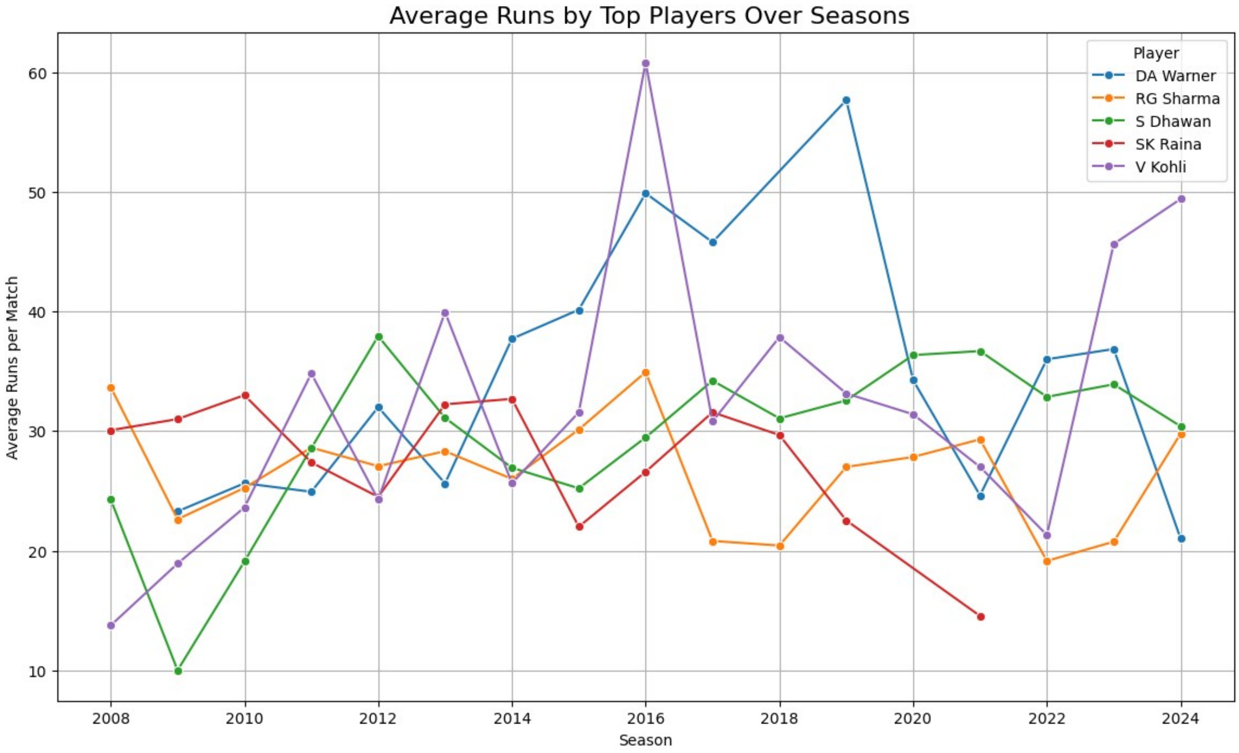
# Winning and Losing Patterns by Season

```python
merged_df['season'] = pd.to_datetime(merged_df['date']).dt.year

# Count wins by team per season
season_wins = merged_df.groupby(['season',
'winner']).size().reset_index(name='wins')

# Correct pivot syntax with keyword arguments
season_wins_pivot = season_wins.pivot(index='season',
columns='winner', values='wins').fillna(0)

# Plot heatmap
plt.figure(figsize=(14, 10))
sns.heatmap(season_wins_pivot, annot=True, fmt='.0f', cmap='coolwarm',
linewidths=1, linecolor='black')
plt.title('Wins by Team per Season', fontsize=16)
plt.xlabel('Team')
plt.ylabel('Season')
plt.show()
```



# players with consistent high performance.

```
player_season_runs = merged_df.groupby(['batter',
'season']).agg({'batsman_runs': 'sum', 'match_id':
'nunique'}).reset_index()

player_season_runs['avg_runs'] = player_season_runs['batsman_runs'] /
player_season_runs['match_id']

top_players = player_season_runs.groupby('batter')
['batsman_runs'].sum().nlargest(5).index
top_players_df =
player_season_runs[player_season_runs['batter'].isin(top_players)]

# Plotting
plt.figure(figsize=(14, 8))
sns.lineplot(x='season', y='avg_runs', hue='batter',
data=top_players_df, marker='o', palette='tab10')
plt.title(' Average Runs by Top Players Over Seasons', fontsize=16)
plt.xlabel('Season')
plt.ylabel('Average Runs per Match')
plt.legend(title='Player')
plt.grid(True)
plt.show()
```



# Correlation Between Strike Rate and Winning

```
# Future-proof solution
team_strike_rate = merged_df.groupby('batting_team',
group_keys=False).apply(
    lambda x: (x['batsman_runs'].sum() / len(x)) * 100,
include_groups=False
).reset_index(name='strike_rate')


team_wins =
merged_df.groupby('winner').size().reset_index(name='wins')
```

```
team_stats = pd.merge(team_strike_rate, team_wins,
left_on='batting_team', right_on='winner', how='left').fillna(0)

correlation = team_stats['strike_rate'].corr(team_stats['wins'])
print(f"\nCorrelation between Strike Rate and Wins:
{correlation:.2f}")
```

```

Correlation between Strike Rate and Wins: -0.01
```