cwc23-eda

January 14, 2024

Table of contents

Data Analysis

Step 1: Import Python Libraries
Step 2: Reading Dataset
Step 3: Data Reduction
Step 4: Feature Engineering
Step 5: Creating Features
Step 6: Data Cleaning/Wrangling
Step 7: EDA Exploratory Data Analysis

0.0.1 Step 1: Import Python Libraries

[2]:
```
# Import necessary libraries

import os  # For interacting with the operating system
import pandas as pd  # For data manipulation and analysis
import matplotlib.pyplot as plt  # For creating visualizations
import seaborn as sns  # For statistical data visualization
import zipfile  # For working with zip files
```

0.0.2 Step 2: Reading Dataset

[3]:
```
# Unzip the ODI World Cup 2023 dataset to a specific directory
!unzip -q '/content/ODIWorldCup2023CompleteDataset.zip' -d '/content/dataset'
```

[4]:
```
# Define file paths for various datasets related to the ODI World Cup 2023
batting_summary_fpath = '/content/dataset/odi world cup 2023 dataset/
 ↪batting_summary.csv'
bowling_summary_fpath = '/content/dataset/odi world cup 2023 dataset/
 ↪bowling_summary.csv'
match_schedule_results_fpath = '/content/dataset/odi world cup 2023 dataset/
 ↪match_schedule_results.csv'
world_cup_players_info_fpath = '/content/dataset/odi world cup 2023 dataset/
 ↪world_cup_players_info.csv'
```

[5]:
```
# Read CSV files into Pandas DataFrames
df_batting_summary = pd.read_csv(batting_summary_fpath)
df_bowling_summary = pd.read_csv(bowling_summary_fpath)
df_match_schedule_results = pd.read_csv(match_schedule_results_fpath)
df_world_cup_players = pd.read_csv(world_cup_players_info_fpath)
```

Understanding Data

[6]:
```
# Display the first few rows of the batting summary DataFrame
df_batting_summary.head()
```

[6]:

	Match_no	Match_Between	Team_Innings	Batsman_Name	Batting_Position	Dismissal	Runs	Balls	4s	6s	Strike_Rate
0	1	England vs New Zealand	England	Jonny Bairstow	1	c Daryl Mitchell b Mitchell Santner	33	35	4	1	94.300
1	1	England vs New Zealand	England	Dawid Malan	2	c Tom Latham b Matt Henry	14	24	2	0	58.300
2	1	England vs New Zealand	England	Joe Root	3	b Glenn Phillips	77	86	4	1	89.500
3	1	England vs New Zealand	England	Harry Brook	4	c Devon Conway b Rachin Ravindra	25	16	4	1	156.300
4	1	England vs New Zealand	England	Moeen Ali	5	b Glenn Phillips	11	17	1	0	64.700

[7]:
```
# Display the first few rows of the bowling summary DataFrame
df_bowling_summary.head()
```

[7]:

	Match_no	Match_Between	Bowling_Team	Bowler_Name	Overs	Maidens	Runs	Wickets	Economy
0	1	England vs New Zealand	New Zealand	Trent Boult	10.0	1	48	1	4.8
1	1	England vs New Zealand	New Zealand	Matt Henry	10.0	1	48	3	4.8
2	1	England vs New Zealand	New Zealand	Mitchell Santner	10.0	0	37	2	3.7
3	1	England vs New Zealand	New Zealand	Jimmy Neesham	7.0	0	56	0	8.0
4	1	England vs New Zealand	New Zealand	Rachin Ravindra	10.0				

```
4        0    76        1      7.6
```

[8]:
```
# Display the first few rows of the match schedule and results DataFrame
df_match_schedule_results.head()
```

[8]:
```
   Match_no       Date       Venue          Team1         Team2        Winner  \
0         1  October 5   Ahmedabad        England    New Zealand   New Zealand
1         2  October 6   Hyderabad       Pakistan    Netherlands      Pakistan
2         3  October 7  Dharamsala     Bangladesh    Afghanistan    Bangladesh
3         4  October 7       Delhi   South Africa      Sri Lanka  South Africa
4         5  October 8     Chennai          India      Australia         India

                                    Scorecard URL
0  https://www.cricketwa.com/scorecard/18020/engl…
1  https://www.cricketwa.com/scorecard/18021/paki…
2  https://www.cricketwa.com/scorecard/23008/bang…
3  https://www.cricketwa.com/scorecard/23009/sout…
4  https://www.cricketwa.com/scorecard/23010/indi…
```

[9]:
```
# Display the first few rows of the World Cup players information DataFrame
df_world_cup_players.head()
```

[9]:
```
       player_name    team_name image_of_player    battingStyle  \
0   Jonny Bairstow      England                  Right-hand bat
1        Joe Root      England                  Right hand Bat
2     Jos Buttler      England                  Right hand Bat
3      Will Young  New Zealand                  Right hand Bat
4  Rachin Ravindra  New Zealand                   Left hand Bat

             bowlingStyle          playingRole  \
0   Right-arm fast-medium  Wicketkeeper Batter
1      Right arm Offbreak     Top order Batter
2                          Wicketkeeper Batter
3      Right arm Offbreak     Top order Batter
4  Slow Left arm Orthodox     Top order Batter

                                         description
0  Jonny Bairstow is an English cricketer known f…
1  Joe Root is an English cricketer known for his…
2  Jos Buttler is an English cricketer known for …
3  Will Young is a New Zealand cricketer known fo…
4  Rachin Ravindra is a New Zealand cricketer kno…
```

[10]:
```
# Print the shapes of the DataFrames to provide information on the number of␣
 ↪rows and columns
print(f"Shape of Batting Summary: {df_batting_summary.shape}")
print(f"Shape of Bowling Summary: {df_bowling_summary.shape}")
```

```
print(f"Shape of Match Schedule Results: {df_match_schedule_results.shape}")
print(f"Shape of World Cup Players Info: {df_world_cup_players.shape}")
```

```
Shape of Batting Summary: (916, 11)
Shape of Bowling Summary: (574, 9)
Shape of Match Schedule Results: (48, 7)
Shape of World Cup Players Info: (151, 7)
```

[11]:
```
# Print the data types of columns in each DataFrame
print(f"Data Types of Batting Summary: {df_batting_summary.dtypes}\n")
print(f"Data Types of Bowling Summary: {df_bowling_summary.dtypes}\n")
print(f"Data Types Shape of Match Schedule Results: {df_match_schedule_results.
  ↪dtypes}\n")
print(f"Data Types Shape of World Cup Players Info: {df_world_cup_players.
  ↪dtypes}")
```

```
Data Types of Batting Summary: Match_no             int64
Match_Between       object
Team_Innings        object
Batsman_Name        object
Batting_Position     int64
Dismissal           object
Runs                 int64
Balls                int64
4s                   int64
6s                   int64
Strike_Rate         object
dtype: object

Data Types of Bowling Summary: Match_no           int64
Match_Between     object
Bowling_Team      object
Bowler_Name       object
Overs            float64
Maidens            int64
Runs               int64
Wickets            int64
Economy          float64
dtype: object

Data Types Shape of Match Schedule Results: Match_no          int64
Date              object
Venue             object
Team1             object
Team2             object
Winner            object
Scorecard URL     object
```

```
dtype: object

Data Types Shape of World Cup Players Info: player_name        object
team_name          object
image_of_player    object
battingStyle       object
bowlingStyle       object
playingRole        object
description        object
dtype: object
```

[12]:
```
# Print concise summary of each DataFrame's info, including data types and memory usage
print(f"Info of Batting Summary: {df_batting_summary.info()}\n")
print(f"Info of Bowling Summary: {df_bowling_summary.info()}\n")
print(f"Info of Match Schedule Results: {df_match_schedule_results.info()}\n")
print(f"Info of World Cup Players Info: {df_world_cup_players.info()}")
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 916 entries, 0 to 915
Data columns (total 11 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   Match_no          916 non-null    int64
 1   Match_Between     916 non-null    object
 2   Team_Innings      916 non-null    object
 3   Batsman_Name      916 non-null    object
 4   Batting_Position  916 non-null    int64
 5   Dismissal         914 non-null    object
 6   Runs              916 non-null    int64
 7   Balls             916 non-null    int64
 8   4s                916 non-null    int64
 9   6s                916 non-null    int64
 10  Strike_Rate       916 non-null    object
dtypes: int64(6), object(5)
memory usage: 78.8+ KB
Info of Batting Summary: None

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 574 entries, 0 to 573
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Match_no       574 non-null    int64
 1   Match_Between  574 non-null    object
 2   Bowling_Team   574 non-null    object
 3   Bowler_Name    574 non-null    object
 4   Overs          574 non-null    float64
```

```
 5   Maidens         574 non-null    int64
 6   Runs            574 non-null    int64
 7   Wickets         574 non-null    int64
 8   Economy         574 non-null    float64
dtypes: float64(2), int64(4), object(3)
memory usage: 40.5+ KB
Info of Bowling Summary: None

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 48 entries, 0 to 47
Data columns (total 7 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Match_no        48 non-null     int64
 1   Date            48 non-null     object
 2   Venue           48 non-null     object
 3   Team1           48 non-null     object
 4   Team2           48 non-null     object
 5   Winner          48 non-null     object
 6   Scorecard URL   48 non-null     object
dtypes: int64(1), object(6)
memory usage: 2.8+ KB
Info of Match Schedule Results: None

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 151 entries, 0 to 150
Data columns (total 7 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   player_name       151 non-null    object
 1   team_name         151 non-null    object
 2   image_of_player   85 non-null     object
 3   battingStyle      151 non-null    object
 4   bowlingStyle      145 non-null    object
 5   playingRole       151 non-null    object
 6   description       134 non-null    object
dtypes: object(7)
memory usage: 8.4+ KB
Info of World Cup Players Info: None
```

[13]:
```python
# Print the number of duplicate values in each DataFrame
print(f"No. of Duplicate values in Batting Summary: {df_batting_summary.
  ↪duplicated().sum()}")
print(f"No. of Duplicate values in Bowling Summary: {df_bowling_summary.
  ↪duplicated().sum()}")
print(f"No. of Duplicate values in Match Schedule Results:␣
  ↪{df_match_schedule_results.duplicated().sum()}")
```

```
print(f"No. of Duplicate values in World Cup Players Info:␣
  ↪{df_world_cup_players.duplicated().sum()}")
```

```
No. of Duplicate values in Batting Summary: 0
No. of Duplicate values in Bowling Summary: 0
No. of Duplicate values in Match Schedule Results: 0
No. of Duplicate values in World Cup Players Info: 0
```

[14]:
```
# Print the number of null values in each column of each DataFrame
print(f"Null values in Batting Summary: \n{df_batting_summary.isnull().
  ↪sum()}\n")
print(f"Null values in Bowling Summary: \n{df_bowling_summary.isnull().
  ↪sum()}\n")
print(f"Null values in Match Schedule Results: \n{df_match_schedule_results.
  ↪isnull().sum()}\n")
print(f"Null values in World Cup Players Info: \n{df_world_cup_players.isnull().
  ↪sum()}")
```

```
Null values in Batting Summary:
Match_no            0
Match_Between       0
Team_Innings        0
Batsman_Name        0
Batting_Position    0
Dismissal           2
Runs                0
Balls               0
4s                  0
6s                  0
Strike_Rate         0
dtype: int64

Null values in Bowling Summary:
Match_no         0
Match_Between    0
Bowling_Team     0
Bowler_Name      0
Overs            0
Maidens          0
Runs             0
Wickets          0
Economy          0
dtype: int64

Null values in Match Schedule Results:
Match_no         0
Date             0
```

```
Venue            0
Team1            0
Team2            0
Winner           0
Scorecard URL    0
dtype: int64

Null values in World Cup Players Info:
player_name         0
team_name           0
image_of_player    66
battingStyle        0
bowlingStyle        6
playingRole         0
description        17
dtype: int64
```

[15]:
```
# Print the percentage of null values in each column of each DataFrame
print(f"% of Null values in Batting Summary: \n{(df_batting_summary.isnull().
  ↪sum()/(len(df_batting_summary)))*100}\n")
print(f"% of Null values in Bowling Summary: \n{(df_bowling_summary.isnull().
  ↪sum()/(len(df_bowling_summary)))*100}\n")
print(f"% of Null values in Match Schedule Results:␣
  ↪\n{(df_match_schedule_results.isnull().sum()/
  ↪(len(df_match_schedule_results)))*100}\n")
print(f"% ofNull values in World Cup Players Info: \n{(df_world_cup_players.
  ↪isnull().sum()/(len(df_world_cup_players)))*100}")
```

```
% of Null values in Batting Summary:
Match_no            0.000000
Match_Between       0.000000
Team_Innings        0.000000
Batsman_Name        0.000000
Batting_Position    0.000000
Dismissal           0.218341
Runs                0.000000
Balls               0.000000
4s                  0.000000
6s                  0.000000
Strike_Rate         0.000000
dtype: float64

% of Null values in Bowling Summary:
Match_no         0.0
Match_Between    0.0
Bowling_Team     0.0
Bowler_Name      0.0
```

```
Overs            0.0
Maidens          0.0
Runs             0.0
Wickets          0.0
Economy          0.0
dtype: float64

% of Null values in Match Schedule Results:
Match_no         0.0
Date             0.0
Venue            0.0
Team1            0.0
Team2            0.0
Winner           0.0
Scorecard URL    0.0
dtype: float64

% ofNull values in World Cup Players Info:
player_name         0.000000
team_name           0.000000
image_of_player    43.708609
battingStyle        0.000000
bowlingStyle        3.973510
playingRole         0.000000
description        11.258278
dtype: float64
```

0.0.3 Step 3: Data Reduction

[16]:
```
# Iterate over rows using enumerate to get both index and boolean value␣
 ↪indicating NaN presence in each row
for id, has_nan in enumerate(df_batting_summary.isna().any(axis=1)):
    # Check if the row has any NaN values
    if has_nan:
        # Print the index of rows with NaN values
        print(id)
```

```
679
740
```

[17]:
```
# Display the shape (number of rows and columns) of the DataFrame
df_batting_summary.shape
```

[17]: (916, 11)

[18]:
```
# Create a new DataFrame by removing rows containing NaN values
new_df_batting_summary = df_batting_summary.dropna()
```

```
# Display the shape (number of rows and columns) of the new DataFrame without␣
 ↪NaN values
new_df_batting_summary.shape
```

[18]: (914, 11)

[19]:
```
# Remove duplicate rows from the new DataFrame
new_df_batting_summary = new_df_batting_summary.drop_duplicates()

# Display the shape (number of rows and columns) of the DataFrame after␣
 ↪removing duplicates
new_df_batting_summary.shape
```

[19]: (914, 11)

[20]:
```
# Drop specific rows by index from the new DataFrame in-place
new_df_batting_summary.drop(axis=0, index=[161, 200], inplace=True)

# Display the shape (number of rows and columns) of the DataFrame after␣
 ↪dropping specified rows
new_df_batting_summary.shape
```

[20]: (912, 11)

[21]:
```
# Create a new DataFrame by dropping specified columns ('image_of_player',␣
 ↪'description')
new_df_world_cup_players = df_world_cup_players.drop(['image_of_player',␣
 ↪'description'], axis=1)

# Display the shape (number of rows and columns) of the new DataFrame
new_df_world_cup_players.shape
```

[21]: (151, 5)

Saving Reducted Data to CSV Files

[22]:
```
# def save_dataframes_to_csv(dataframes_dict):
#     """
#     Save each DataFrame in the given dictionary to a CSV file with the same␣
 ↪name.

#     Parameters:
#     - dataframes_dict: Dictionary containing DataFrame names as keys and␣
 ↪DataFrames as values.

#     Returns:
```

```
#     - result_dict: Dictionary containing DataFrame names as keys and␣
 ↪corresponding CSV file names as values.
#     """
#     result_dict = {}

#     for df_name, df in dataframes_dict.items():
#         # Save DataFrame to CSV with the same name as DataFrame
#         csv_filename = f"{df_name}.csv"
#         df.to_csv(csv_filename, index=False)

#         # Store the CSV filename in the result dictionary
#         result_dict[df_name] = csv_filename

#     return result_dict

# # DataFrames
# dataframes_dict = {
#     'new_df_batting_summary': new_df_batting_summary,
#     'df_bowling_summary': df_bowling_summary,
#     'df_match_schedule_results': df_match_schedule_results,
#     'new_df_world_cup_players': new_df_world_cup_players
# }

# # Call the function with the dictionary of DataFrames
# result_filenames = save_dataframes_to_csv(dataframes_dict)

# # Print the result
# print("CSV filenames for each DataFrame:")
# print(result_filenames)
```

[23]:
```
# # Assuming you have previously created and saved CSV files using the␣
 ↪save_dataframes_to_csv function

# csv_filenames = ['new_df_batting_summary.csv', 'df_bowling_summary.csv',␣
 ↪'df_match_schedule_results.csv', 'new_df_world_cup_players.csv']

# # Specify the name for the zip file
# zip_filename = 'dataframes.zip'

# # Create a zip file and add CSV files to it
# with zipfile.ZipFile(zip_filename, 'w') as zip_file:
#     for csv_filename in csv_filenames:
#         zip_file.write(csv_filename)

# # Download the zip file
# from google.colab import files
# files.download(zip_filename)
```

0.0.4 Step 4: Feature Engineering

0.0.5 Step 5: Creating Features

Feature Engineering from Batting_Summary File

[24]:
```
# Display the first few rows of the DataFrame 'new_df_batting_summary'
new_df_batting_summary.head()
```

[24]:
```
   Match_no           Match_Between Team_Innings    Batsman_Name  \
0         1  England vs New Zealand      England  Jonny Bairstow
1         1  England vs New Zealand      England     Dawid Malan
2         1  England vs New Zealand      England        Joe Root
3         1  England vs New Zealand      England     Harry Brook
4         1  England vs New Zealand      England       Moeen Ali

   Batting_Position                          Dismissal  Runs  Balls  4s  6s  \
0                 1  c Daryl Mitchell b Mitchell Santner    33     35   4   1
1                 2            c Tom Latham b Matt Henry    14     24   2   0
2                 3                    b Glenn Phillips    77     86   4   1
3                 4     c Devon Conway b Rachin Ravindra    25     16   4   1
4                 5                    b Glenn Phillips    11     17   1   0

  Strike_Rate
0      94.300
1      58.300
2      89.500
3     156.300
4      64.700
```

[25]:
```
# Display the shape (number of rows and columns) of the DataFrame␣
↪'new_df_batting_summary'
new_df_batting_summary.shape
```

[25]:
```
(912, 11)
```

Added New Attributes

1. **Total_Boundries**

[26]:
```
# Calculate and add a new column 'Total_Boundaries' by summing up '4s' and '6s'␣
↪columns for each row
new_df_batting_summary['Total_Boundaries'] = new_df_batting_summary.loc[:,␣
↪['4s', '6s']].sum(axis=1)

# Display the first few rows of the DataFrame 'new_df_batting_summary' with the␣
↪new column
new_df_batting_summary.head()
```

[26]:
	Match_no	Match_Between	Team_Innings	Batsman_Name	\
0	1	England vs New Zealand	England	Jonny Bairstow	
1	1	England vs New Zealand	England	Dawid Malan	
2	1	England vs New Zealand	England	Joe Root	
3	1	England vs New Zealand	England	Harry Brook	
4	1	England vs New Zealand	England	Moeen Ali	

	Batting_Position	Dismissal	Runs	Balls	4s	6s	\
0	1	c Daryl Mitchell b Mitchell Santner	33	35	4	1	
1	2	c Tom Latham b Matt Henry	14	24	2	0	
2	3	b Glenn Phillips	77	86	4	1	
3	4	c Devon Conway b Rachin Ravindra	25	16	4	1	
4	5	b Glenn Phillips	11	17	1	0	

	Strike_Rate	Total_Boundaries
0	94.300	5
1	58.300	2
2	89.500	5
3	156.300	5
4	64.700	1

[27]:
```
# Display the shape (number of rows and columns) of the DataFrame␣
↪'new_df_batting_summary'
new_df_batting_summary.shape
```

[27]: (912, 12)

Feature Engineering from Bowling_Summary File

[28]:
```
# Display the first few rows of the DataFrame 'df_bowling_summary'
df_bowling_summary.head()
```

[28]:
	Match_no	Match_Between	Bowling_Team	Bowler_Name	Overs	\
0	1	England vs New Zealand	New Zealand	Trent Boult	10.0	
1	1	England vs New Zealand	New Zealand	Matt Henry	10.0	
2	1	England vs New Zealand	New Zealand	Mitchell Santner	10.0	
3	1	England vs New Zealand	New Zealand	Jimmy Neesham	7.0	
4	1	England vs New Zealand	New Zealand	Rachin Ravindra	10.0	

	Maidens	Runs	Wickets	Economy
0	1	48	1	4.8
1	1	48	3	4.8
2	0	37	2	3.7
3	0	56	0	8.0
4	0	76	1	7.6

[29]:
```
# Display the shape (number of rows and columns) of the DataFrame␣
↪'df_bowling_summary'
df_bowling_summary.shape
```

[29]:
```
(574, 9)
```

Added New Attributes

1. **Total_Balls**

[30]:
```
def cal_tballs(overs):
    """
    Calculate the total number of balls from overs.

    Parameters:
    - overs: A string representing overs in the format 'x.y' where x is the␣
↪number of completed overs, and y is the number of balls in the current over.

    Returns:
    - total_balls: The total number of balls.
    """
    overs = str(overs)
    balls = overs.split(".")
    total_balls = (int(balls[0]) * 6) + int(balls[1])

    return total_balls
```

[31]:
```
# Apply the cal_tballs function to calculate and add a new column 'Total_Balls'␣
↪based on 'Overs'
df_bowling_summary['Total_Balls'] = df_bowling_summary['Overs'].
↪apply(cal_tballs)
```

[32]:
```
# Display the shape (number of rows and columns) of the DataFrame␣
↪'df_bowling_summary'
df_bowling_summary.shape
```

[32]:
```
(574, 10)
```

Feature Engineering from World_Cup_Players File

[33]:
```
# Display the first few rows of the DataFrame 'new_df_world_cup_players'
new_df_world_cup_players.head()
```

[33]:

	player_name	team_name	battingStyle	bowlingStyle	\
0	Jonny Bairstow	England	Right-hand bat	Right-arm fast-medium	
1	Joe Root	England	Right hand Bat	Right arm Offbreak	
2	Jos Buttler	England	Right hand Bat		
3	Will Young	New Zealand	Right hand Bat	Right arm Offbreak	

```
4  Rachin Ravindra  New Zealand   Left hand Bat  Slow Left arm Orthodox

           playingRole
0  Wicketkeeper Batter
1     Top order Batter
2  Wicketkeeper Batter
3     Top order Batter
4     Top order Batter
```

[34]:
```
# Display the shape (number of rows and columns) of the DataFrame
 ↪'new_df_world_cup_players'
new_df_world_cup_players.shape
```

[34]:
```
(151, 5)
```

Feature Engineering from Match_Schedule_Results File

[35]:
```
# Display the first few rows of the DataFrame 'df_match_schedule_results'
df_match_schedule_results.head()
```

[35]:
```
   Match_no       Date       Venue          Team1         Team2        Winner  \
0         1  October 5   Ahmedabad       England    New Zealand   New Zealand
1         2  October 6   Hyderabad      Pakistan    Netherlands      Pakistan
2         3  October 7  Dharamsala    Bangladesh    Afghanistan    Bangladesh
3         4  October 7       Delhi  South Africa      Sri Lanka  South Africa
4         5  October 8     Chennai         India      Australia         India

                                      Scorecard URL
0  https://www.cricketwa.com/scorecard/18020/engl…
1  https://www.cricketwa.com/scorecard/18021/paki…
2  https://www.cricketwa.com/scorecard/23008/bang…
3  https://www.cricketwa.com/scorecard/23009/sout…
4  https://www.cricketwa.com/scorecard/23010/indi…
```

[36]:
```
# Display the shape (number of rows and columns) of the DataFrame
 ↪'df_match_schedule_results'
df_match_schedule_results.shape
```

[36]:
```
(48, 7)
```

0.0.6 Step 6: Data Cleaning/Wrangling

[37]:
```
# Display the data types of columns in the DataFrame 'new_df_batting_summary'
new_df_batting_summary.dtypes
```

[37]:
```
Match_no             int64
Match_Between       object
```

```
Team_Innings         object
Batsman_Name         object
Batting_Position      int64
Dismissal            object
Runs                  int64
Balls                 int64
4s                    int64
6s                    int64
Strike_Rate          object
Total_Boundaries      int64
dtype: object
```

[38]:
```
# Convert 'Strike_Rate' column to numeric float, replacing non-convertible␣
↪values with NaN
new_df_batting_summary['Strike_Rate'] = pd.
↪to_numeric(new_df_batting_summary['Strike_Rate'], errors='coerce')
```

[39]:
```
new_df_batting_summary.dtypes
```

[39]:
```
Match_no              int64
Match_Between        object
Team_Innings         object
Batsman_Name         object
Batting_Position      int64
Dismissal            object
Runs                  int64
Balls                 int64
4s                    int64
6s                    int64
Strike_Rate         float64
Total_Boundaries      int64
dtype: object
```

0.0.7 Step 7: EDA Exploratory Data Analysis

Batting Stats - ODI Cricket WorldCup 2023 **Batting Stats - ODI Cricket WorldCup 2023**

[40]:
```
# Display the first few rows of the DataFrame 'new_df_batting_summary'
new_df_batting_summary.head()
```

[40]:

	Match_no	Match_Between	Team_Innings	Batsman_Name
0	1	England vs New Zealand	England	Jonny Bairstow
1	1	England vs New Zealand	England	Dawid Malan
2	1	England vs New Zealand	England	Joe Root
3	1	England vs New Zealand	England	Harry Brook
4	1	England vs New Zealand	England	Moeen Ali

```
   Batting_Position                          Dismissal  Runs  Balls  4s  6s  \
0                 1  c Daryl Mitchell b Mitchell Santner    33     35   4   1
1                 2            c Tom Latham b Matt Henry    14     24   2   0
2                 3                    b Glenn Phillips    77     86   4   1
3                 4     c Devon Conway b Rachin Ravindra    25     16   4   1
4                 5                    b Glenn Phillips    11     17   1   0

   Strike_Rate  Total_Boundaries
0         94.3                 5
1         58.3                 2
2         89.5                 5
3        156.3                 5
4         64.7                 1
```

[41]:
```
# Display the shape (number of rows and columns) of the DataFrame␣
 ↪'new_df_batting_summary'
new_df_batting_summary.shape
```

[41]:
```
(912, 12)
```

1. **Top Boundary Scorer - ODI Circket WorldCup 2023**

[42]:
```
# Drop specific rows by index from the DataFrame 'new_df_batting_summary'␣
 ↪in-place
new_df_batting_summary.drop(axis=0, index=[181, 224], inplace=True)

# Display the shape (number of rows and columns) of the DataFrame after␣
 ↪dropping specified rows
new_df_batting_summary.shape
```

[42]:
```
(910, 12)
```

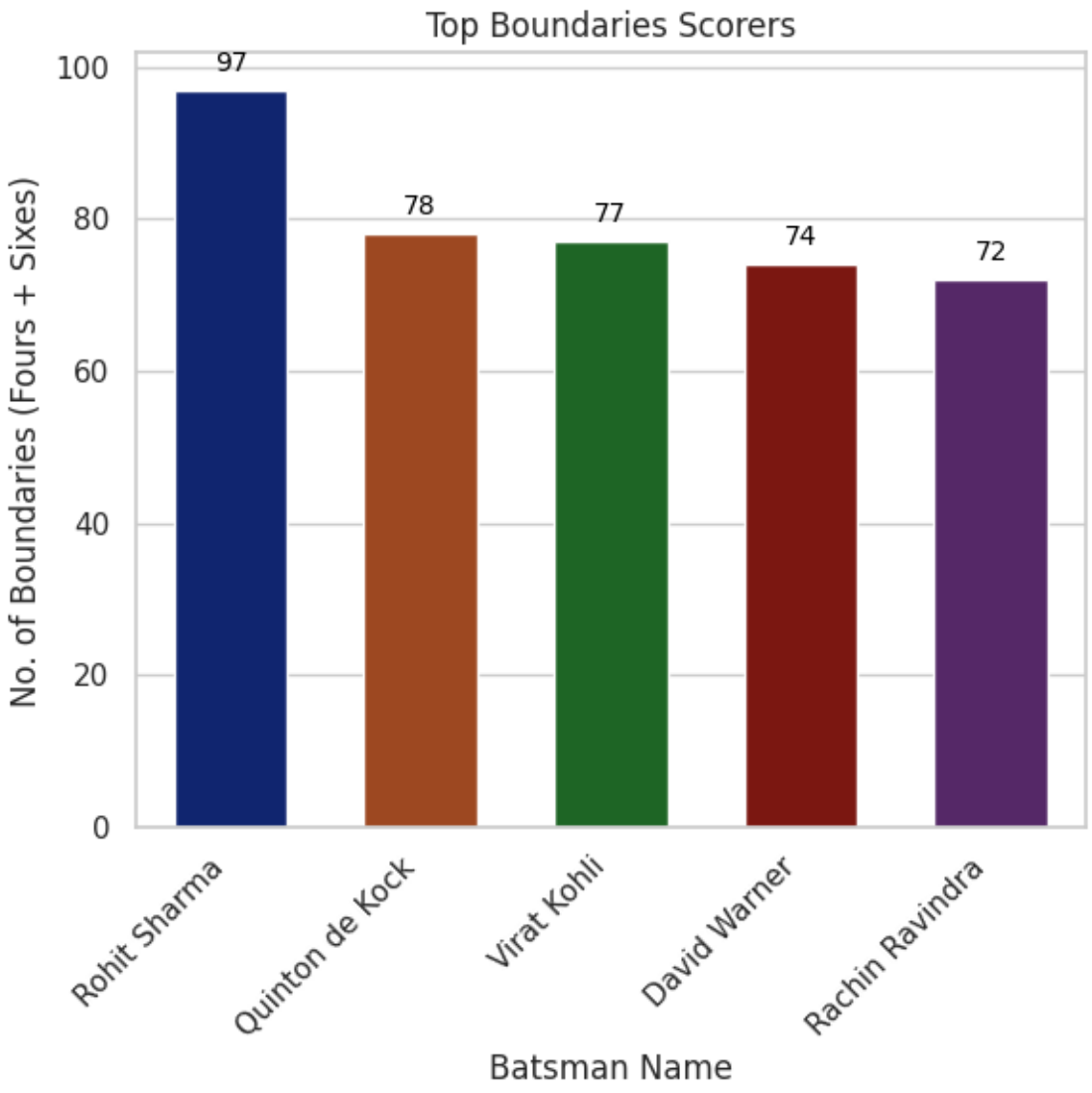
[43]:
```
# Calculate the total boundaries for each player and create a DataFrame
df_total_boundaries = new_df_batting_summary.
 ↪groupby('Batsman_Name')['Total_Boundaries'].sum()
df_total_boundaries = pd.DataFrame(df_total_boundaries,␣
 ↪columns=['Total_Boundaries']).reset_index()

# Find the index of the row with the maximum value in the 'Total_Boundaries'␣
 ↪column
max_index = df_total_boundaries['Total_Boundaries'].idxmax()

# Extract and print the total boundaries and corresponding batsman's name
print(f"Total Boundaries: {df_total_boundaries.at[max_index,␣
 ↪'Total_Boundaries']}")
print(f"Batsman_Name: {df_total_boundaries.at[max_index, 'Batsman_Name']}")
```

```
Total Boundaries: 97
Batsman_Name: Rohit Sharma
```

- Total Boundaries: **97 (Fours & Sixes)**
- Batsman Name: **Rohit Sharma**

[44]:
```
# Create a new DataFrame sorted by 'Total_Boundaries' in descending order
df_top_total_boundaries = df_total_boundaries.
 ↪sort_values(by='Total_Boundaries', ascending=False)
```

[45]:
```
# Select the top 5 batsmen with the highest total boundaries
df = df_top_total_boundaries.head(5)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(6, 6))
ax = sns.barplot(x='Batsman_Name', y='Total_Boundaries', data=df,␣
 ↪palette='dark', width=0.6)

# Annotate each bar with its value
for p in ax.patches:
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='No. of Boundaries (Fours + Sixes)')
plt.title('Top Boundaries Scorers')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



2. **Top 4s Scorer**

[46]:
```
# Calculate the total number of 4s for each player and create a DataFrame
boundaries = new_df_batting_summary.groupby('Batsman_Name')['4s'].sum()
boundaries = pd.DataFrame(boundaries, columns=['4s']).reset_index()

# Find the index of the row with the maximum value in the '4s' column
max_index = boundaries['4s'].idxmax()

# Extract and print the total number of 4s and corresponding batsman's name
print(f"Total 4s: {boundaries.at[max_index, '4s']}")
print(f"Batsman_Name: {boundaries.at[max_index, 'Batsman_Name']}")
```

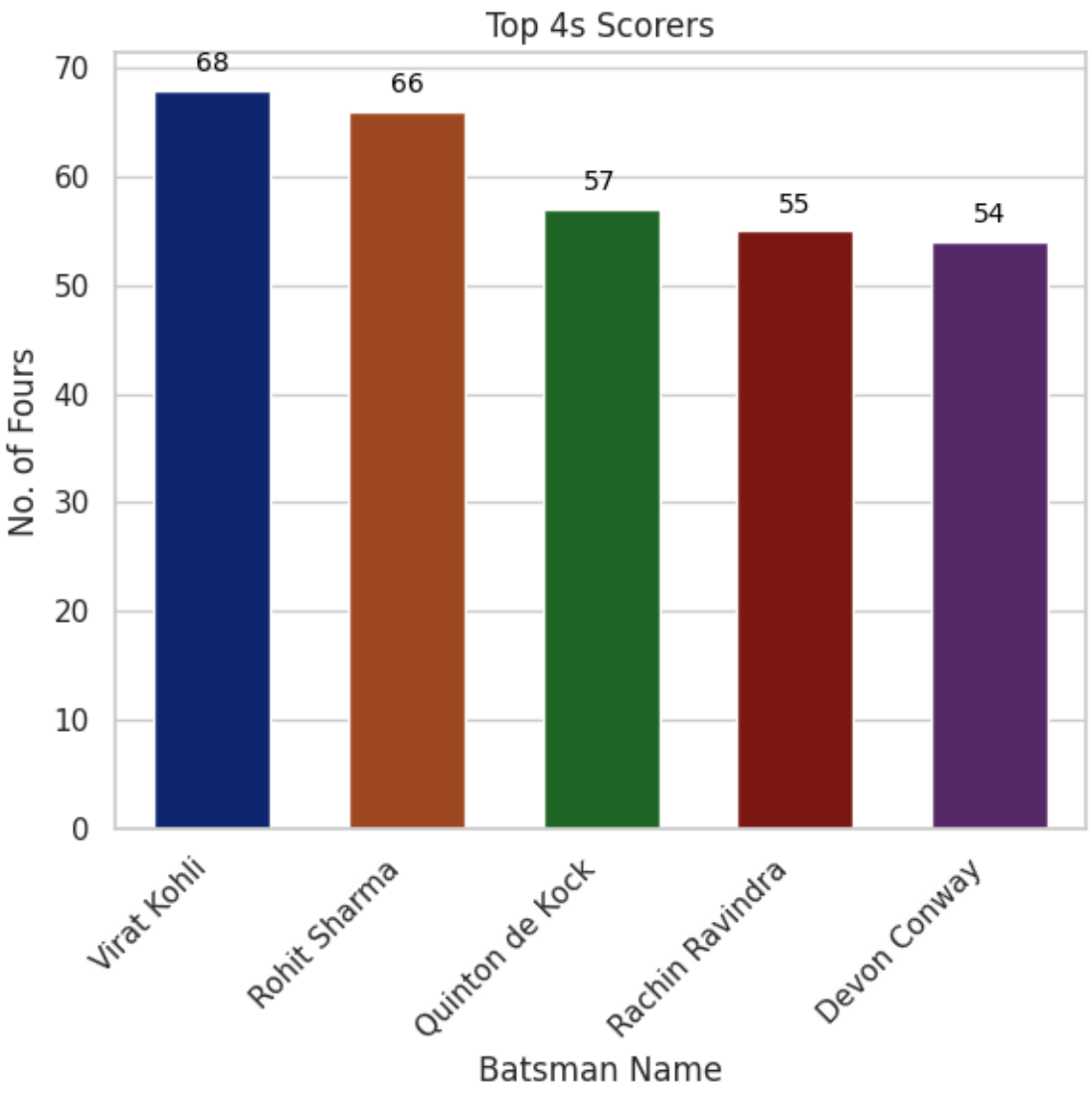
```
Total 4s: 68
```

```
Batsman_Name: Virat Kohli
```

- Total 4s: **68 (Fours)**
- Batsman Name: **Virat Kholi**

[47]:
```
# Create a new DataFrame sorted by '4s' in descending order
df_top_boundaries_4s = boundaries.sort_values(by='4s', ascending=False)
```

[48]:
```
# Select the top 5 batsmen with the highest total number of 4s
df = df_top_boundaries_4s.head(5)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(6, 6))
ax = sns.barplot(x='Batsman_Name', y='4s', data=df, palette='dark', width=0.6)

# Annotate each bar with its value
for p in ax.patches:
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='No. of Fours')
plt.title('Top 4s Scorers')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



3. **Top 6s Scorer**

[49]:
```
# Calculate the total number of 6s for each player and create a DataFrame
boundaries = new_df_batting_summary.groupby('Batsman_Name')['6s'].sum()
boundaries = pd.DataFrame(boundaries, columns=['6s']).reset_index()

# Find the index of the row with the maximum value in the '6s' column
max_index = boundaries['6s'].idxmax()

# Extract and print the total number of 6s and corresponding batsman's name
print(f"Total 6s: {boundaries.at[max_index, '6s']}")
print(f"Batsman_Name: {boundaries.at[max_index, 'Batsman_Name']}")
```

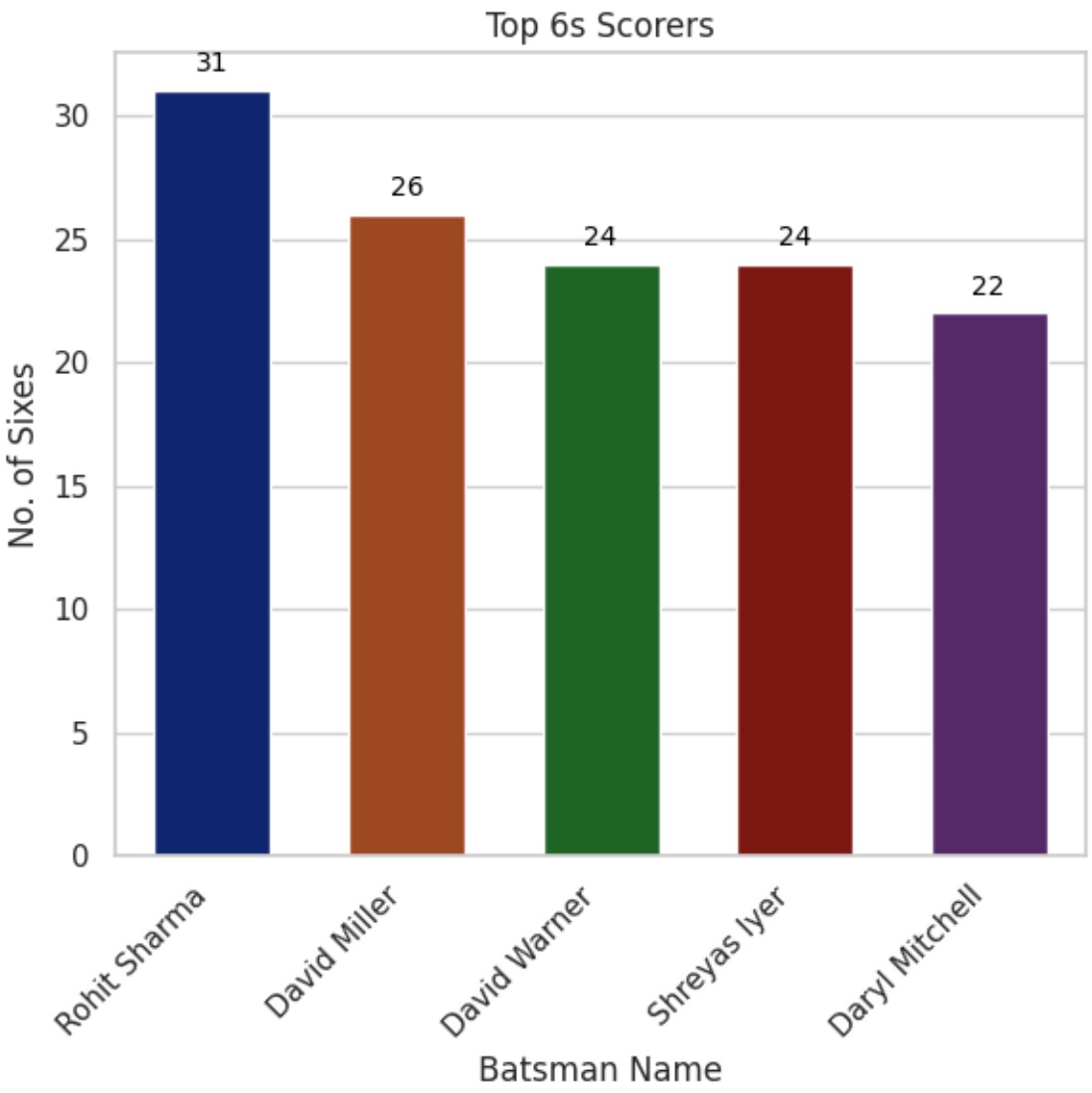
```
Total 6s: 31
```

```
Batsman_Name: Rohit Sharma
```

- Total 6s: **31 (Sixes)**
- Batsman Name: **Rohit Sharma**

[50]:
```
# Create a new DataFrame sorted by '6s' in descending order
df_top_boundaries_6s = boundaries.sort_values(by='6s', ascending=False)
```

[51]:
```
# Select the top 5 batsmen with the highest total number of 6s
df = df_top_boundaries_6s.head(5)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(6, 6))
ax = sns.barplot(x='Batsman_Name', y='6s', data=df, palette='dark', width=0.6)

# Annotate each bar with its value
for p in ax.patches:
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='No. of Sixes')
plt.title('Top 6s Scorers')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



4. **Top Run Scorers**

[52]:
```
# Calculate the total runs for each player and create a DataFrame
most_runs = new_df_batting_summary.groupby('Batsman_Name')['Runs'].sum()
most_runs = pd.DataFrame(most_runs, columns=['Runs']).reset_index()

# Find the index of the row with the maximum value in the 'Runs' column
max_index = most_runs['Runs'].idxmax()

# Extract and print the total runs and corresponding batsman's name
print(f"Total Runs: {most_runs.at[max_index, 'Runs']}")
print(f"Batsman_Name: {most_runs.at[max_index, 'Batsman_Name']}")
```

```
Total Runs: 765
```

```
Batsman_Name: Virat Kohli
```

- Total Runs: **765 (Runs)**
- Batsman Name: **Virat Kholi**

5. **Highest Individual Score by a Batsman - ODI Circket World Cup 2023**

[53]:
```
# Display rows with the maximum runs in the DataFrame 'new_df_batting_summary'
new_df_batting_summary[new_df_batting_summary['Runs'] ==␣
↪new_df_batting_summary['Runs'].max()]
```

[53]:
```
     Match_no             Match_Between Team_Innings   Batsman_Name  \
767        39  Afghanistan vs Australia    Australia  Glenn Maxwell

     Batting_Position Dismissal  Runs  Balls  4s  6s  Strike_Rate  \
767                 6   not out   201    128  21  10        157.0

     Total_Boundaries
767                31
```

- Highest Individual Runs: **201 (Runs)**
- Batsman Name: **Glenn Maxwell**

6. **Highest Strike Rate by a Batsman - ODI Circket World Cup 2023**

[54]:
```
# Display rows with the maximum strike rate in the DataFrame␣
↪'new_df_batting_summary'
new_df_batting_summary[new_df_batting_summary['Strike_Rate'] ==␣
↪new_df_batting_summary['Strike_Rate'].max()]
```

[54]:
```
     Match_no                Match_Between  Team_Innings   Batsman_Name  \
636        32  South Africa vs New Zealand  South Africa  Aiden Markram

     Batting_Position Dismissal  Runs  Balls  4s  6s  Strike_Rate  \
636                 6   run out     6      1   0   1        600.0

     Total_Boundaries
636                 1
```

- Highest Individual Strike Rate: **600 (Strike Rate)**
- Batsman Name: **Aiden Markram**

7. **Top Runs Scorer Batsmen at each Batting Positions - ODI Circket WorldCup 2023**

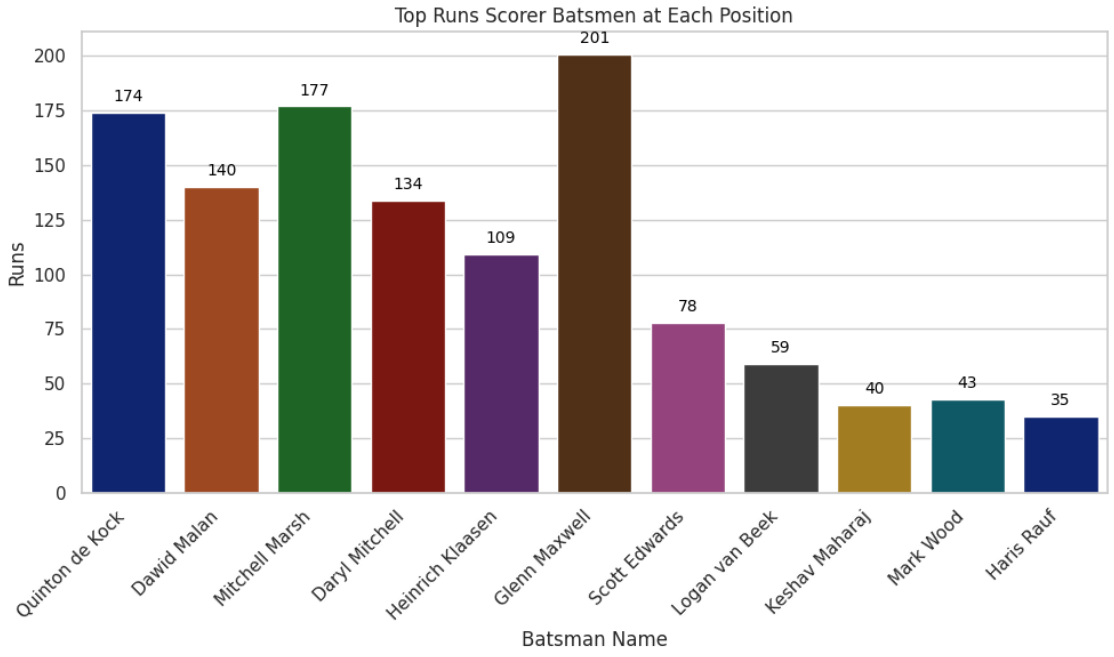
[55]:
```
# Find the index of the top runs scorer batsmen at each batting position
max_runs_indices = new_df_batting_summary.groupby('Batting_Position')['Runs'].
↪idxmax()

# Extract the corresponding values for Batsman_Name, Batting_Position, and Runs
```

```
max_runs_data = new_df_batting_summary.loc[max_runs_indices, ['Batsman_Name',␣
 ↪'Batting_Position', 'Runs']]

# Print the result
print("Maximum runs scored by each batsman at different positions:")
print(max_runs_data)
```

```
Maximum runs scored by each batsman at different positions:
         Batsman_Name  Batting_Position  Runs
458   Quinton de Kock                 1   174
109       Dawid Malan                 2   140
841    Mitchell Marsh                 3   177
891    Daryl Mitchell                 4   134
411  Heinrich Klaasen                 5   109
767     Glenn Maxwell                 6   201
318     Scott Edwards                 7    78
396    Logan van Beek                 8    59
330    Keshav Maharaj                 9    40
425         Mark Wood                10    43
864        Haris Rauf                11    35
```

[56]:
```
# Display the top runs scorer batsmen at each batting position
top_players_max_runs_ep = max_runs_data

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(10, 6))
ax = sns.barplot(x='Batsman_Name', y='Runs', data=top_players_max_runs_ep,␣
 ↪palette='dark')

# Annotate each bar with its value
for p in ax.patches:
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='Runs')
plt.title('Top Runs Scorer Batsmen at Each Position')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
```

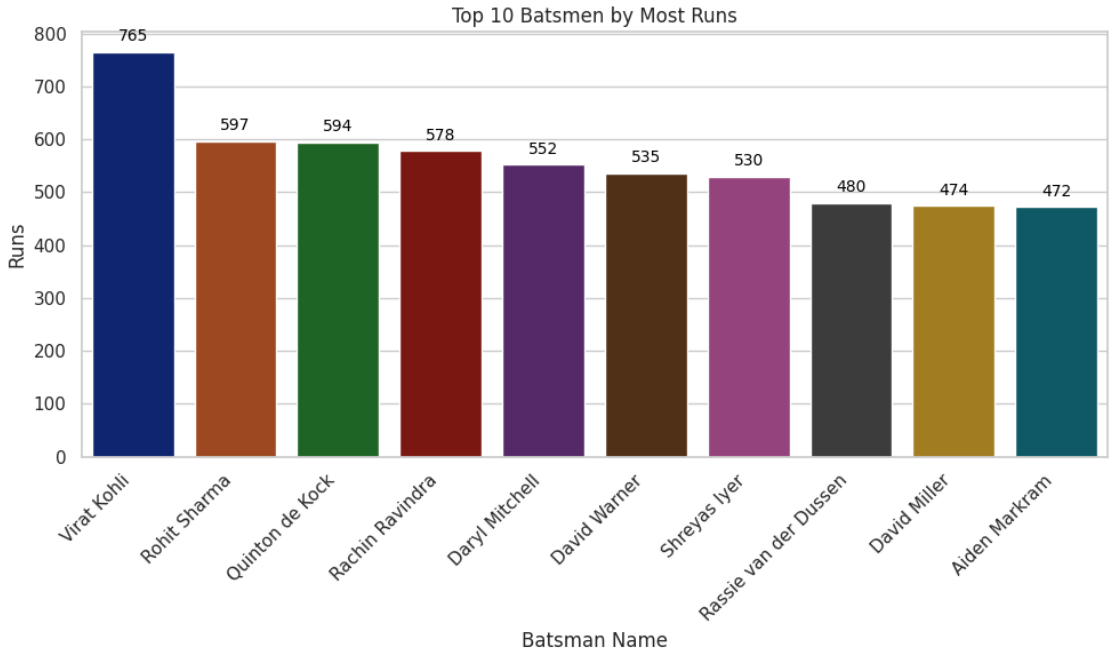
```
plt.tight_layout()
plt.show()
```



8. **Top 10 Batsmen by Most Runs - ODI Cricket WorldCup 2023**

[57]:
```
# Sort the DataFrame by most runs in descending order
sorted_most_runs = most_runs.sort_values(by="Runs", ascending=False)

# Select the top 10 players by most runs
top_10_most_runs_players = sorted_most_runs.head(10)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(10, 6))
ax = sns.barplot(x='Batsman_Name', y='Runs', data=top_10_most_runs_players,␣
↪palette='dark')

# Annotate each bar with its value
for p in ax.patches:
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
↪points', fontsize=10, color='black')
```

```
# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='Runs')
plt.title('Top 10 Batsmen by Most Runs')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



9. Top 10 Batsmen by Batting Average - ODI Circket World Cup 2023

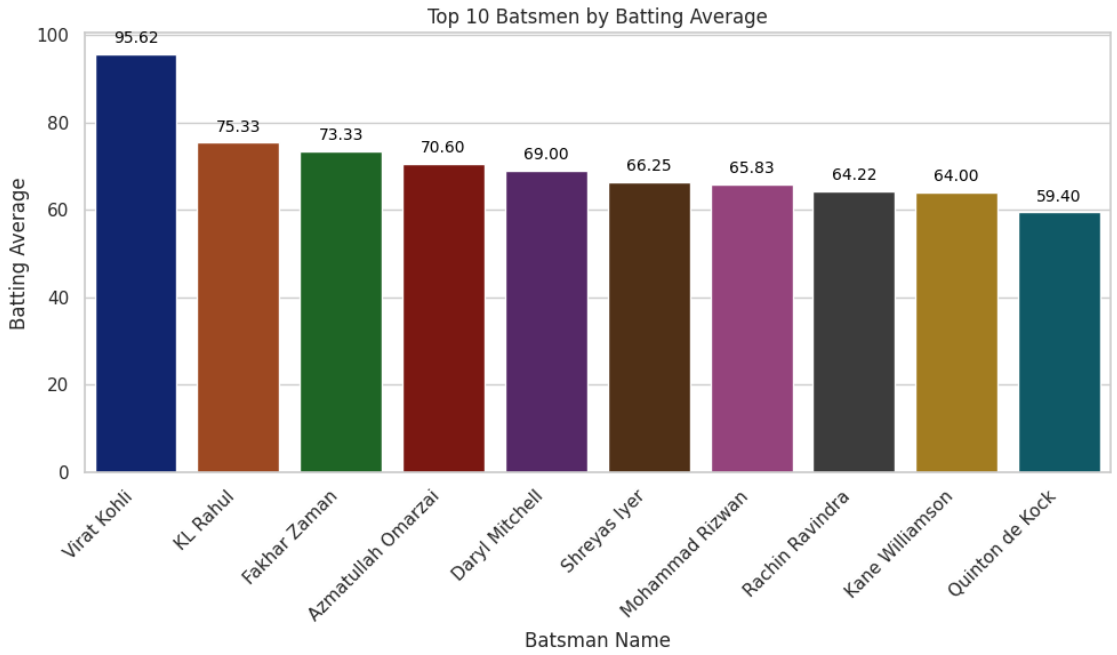
[58]:
```
# Custom function to map dismissal values to binary (1 for 'out' and 0 for 'not out')
def map_dismissal(value):
    return 0 if value == 'not out' else 1

# Apply the custom function to the 'Dismissal' column and create a new column 'Out'
new_df_batting_summary['Out'] = new_df_batting_summary['Dismissal'].apply(map_dismissal)
```

[59]:
```
# Create DataFrames for total runs and total dismissals
df_batsman_runs = pd.DataFrame(new_df_batting_summary.
 ↪groupby(['Batsman_Name'])['Runs'].sum()).reset_index()
df_batsman_out = pd.DataFrame(new_df_batting_summary.
 ↪groupby(['Batsman_Name'])['Out'].sum()).reset_index()

# Col-wise concatenation (stacking one DataFrame next to another)
df_batsman_average = pd.concat([df_batsman_runs, df_batsman_out['Out']], axis=1)

# Function to calculate batting average
def calculate_batting_average(df):
    total_runs = df['Runs']
    num_dismissals = df['Out']

    # Avoid division by zero, return None if the player was not dismissed
    if num_dismissals == 0:
        return None
    else:
        return total_runs / num_dismissals

# Apply the custom function to create a new column 'Batting_Average'
df_batsman_average['Batting_Average'] = df_batsman_average.
 ↪apply(calculate_batting_average, axis=1)

# Display the modified DataFrame
# print(df_batsman_average[['Batsman_Name', 'Batting_Average']])
```

[60]:
```
# Sort dataframe by batting average in descending order
sorted_dataframe = df_batsman_average.sort_values(by="Batting_Average",␣
 ↪ascending=False)
```

[61]:
```
# Select the top 10 players by batting average
top_10_batting_average_players = sorted_dataframe.head(10)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(10, 6))
ax = sns.barplot(x='Batsman_Name', y='Batting_Average',␣
 ↪data=top_10_batting_average_players, palette='dark')

# Annotate each bar with its value (rounded to 2 decimal places)
for p in ax.patches:
    ax.annotate(f'{p.get_height():.2f}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
```

```
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='Batting Average')
plt.title('Top 10 Batsmen by Batting Average')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



10. **Top Batsmen by Most Centuries and Fifties Scored - ODI Circket World Cup 2023**

[62]:
```
new_df_batting_summary.head()
```

[62]:

	Match_no	Match_Between	Team_Innings	Batsman_Name
0	1	England vs New Zealand	England	Jonny Bairstow
1	1	England vs New Zealand	England	Dawid Malan
2	1	England vs New Zealand	England	Joe Root
3	1	England vs New Zealand	England	Harry Brook
4	1	England vs New Zealand	England	Moeen Ali

```
   Batting_Position                          Dismissal  Runs  Balls  4s  6s  \
0                 1  c Daryl Mitchell b Mitchell Santner    33     35   4   1
1                 2            c Tom Latham b Matt Henry    14     24   2   0
2                 3                    b Glenn Phillips    77     86   4   1
3                 4     c Devon Conway b Rachin Ravindra    25     16   4   1
4                 5                    b Glenn Phillips    11     17   1   0

   Strike_Rate  Total_Boundaries  Out
0         94.3                 5    1
1         58.3                 2    1
2         89.5                 5    1
3        156.3                 5    1
4         64.7                 1    1
```

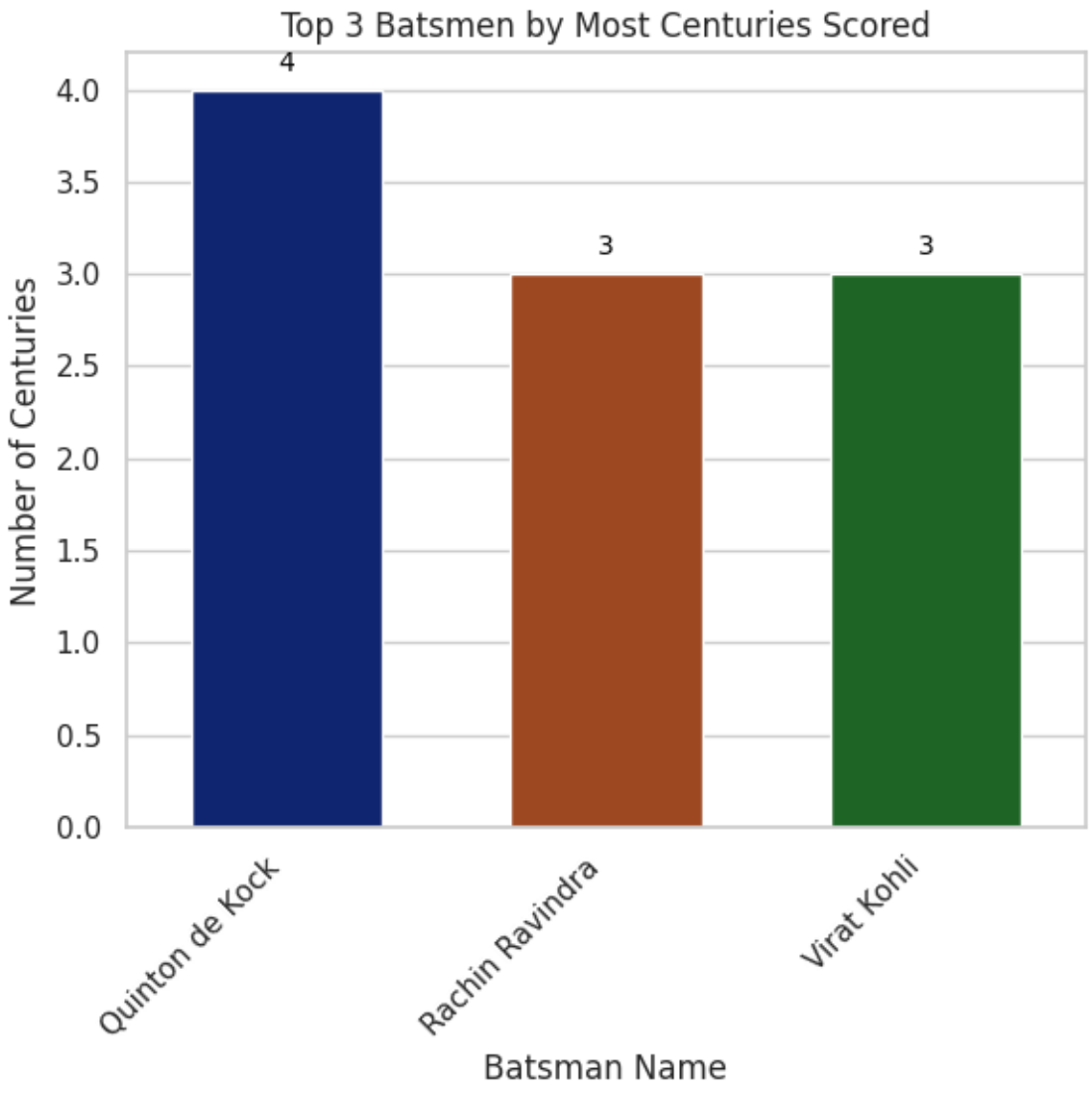
[63]:
```
# Drop rows with specified indices (167, 206) from the DataFrame␣
 ↪'new_df_batting_summary'
new_df_batting_summary.drop(axis=0, index=[167, 206], inplace=True)

# Display the shape of the modified DataFrame
new_df_batting_summary.shape
```

[63]:
```
(908, 13)
```

[64]:
```
# Function to count centuries
def count_centuries(runs):
    if runs >= 100:
        return 1
    else:
        return 0

# Function to count fifties
def count_fifties(runs):
    if 50 <= runs < 100:
        return 1
    else:
        return 0

# Apply the custom functions to create new columns 'Century' and 'Fifty'
new_df_batting_summary['Century'] = new_df_batting_summary['Runs'].
 ↪apply(count_centuries)
new_df_batting_summary['Fifty'] = new_df_batting_summary['Runs'].
 ↪apply(count_fifties)

# Create DataFrames for total centuries and total fifties scored by each player
df_centuries_scored = pd.DataFrame(new_df_batting_summary.
 ↪groupby(['Batsman_Name'])['Century'].sum()).reset_index()
```

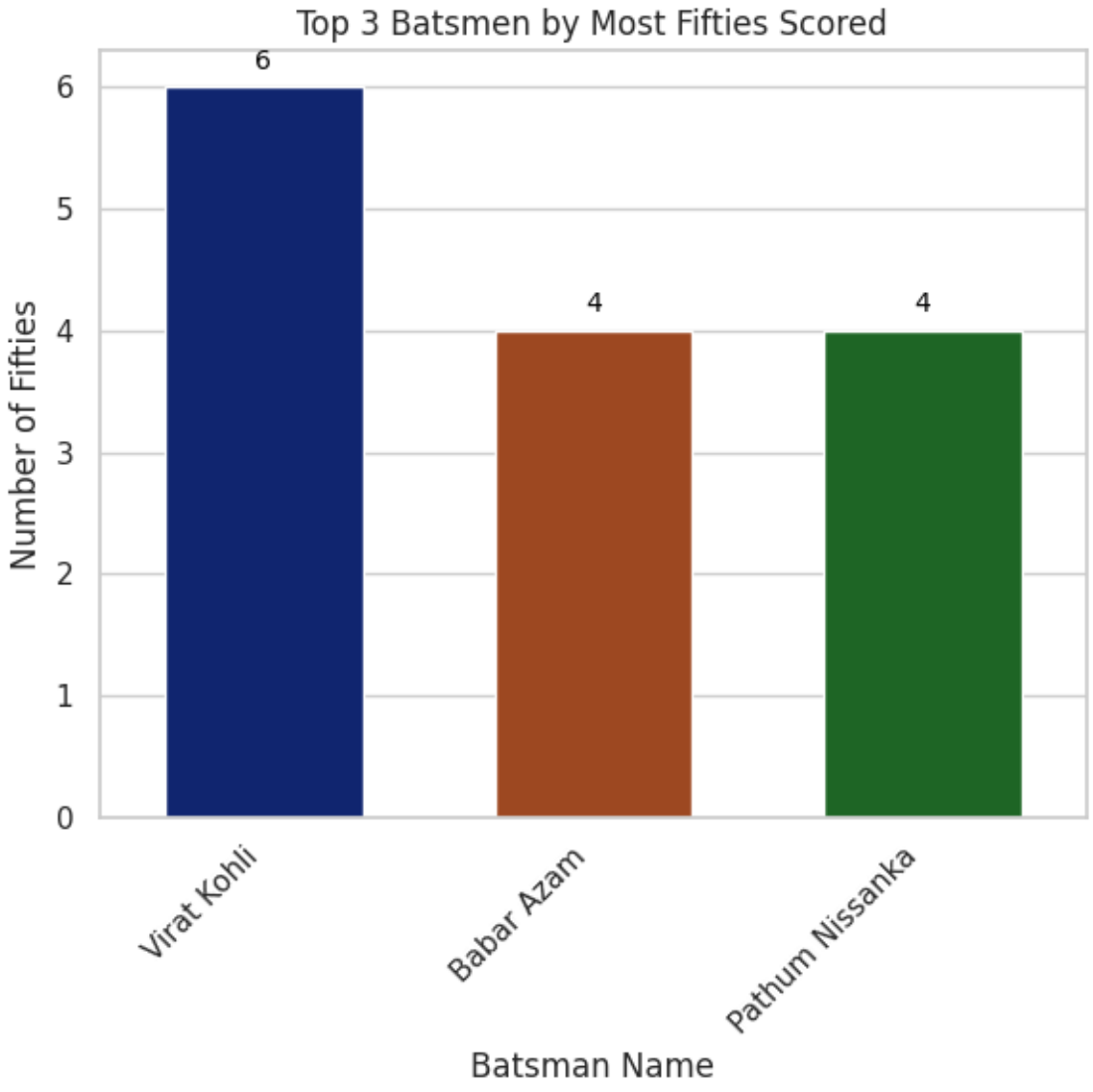
```
df_fifties_scored = pd.DataFrame(new_df_batting_summary.
 ↪groupby(['Batsman_Name'])['Fifty'].sum()).reset_index()

# Sort DataFrames by the total number of centuries and fifties in descending␣
 ↪order
df_centuries_scored = df_centuries_scored.sort_values(by='Century',␣
 ↪ascending=False)
df_fifties_scored = df_fifties_scored.sort_values(by='Fifty', ascending=False)
```

[65]:
```
# Select the top 3 players by the total number of centuries
df_top_centuries_scored = df_centuries_scored.head(3)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(6, 6))
ax = sns.barplot(x='Batsman_Name', y='Century', data=df_top_centuries_scored,␣
 ↪palette='dark', width=0.6)

# Annotate each bar with its value
for p in ax.patches:
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='Number of Centuries')
plt.title('Top 3 Batsmen by Most Centuries Scored')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



[66]:
```
# Select the top 3 players by the total number of fifties
df_top_fifties_scored = df_fifties_scored.head(3)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(6, 6))
ax = sns.barplot(x='Batsman_Name', y='Fifty', data=df_top_fifties_scored,␣
 ↪palette='dark', width=0.6)

# Annotate each bar with its value
for p in ax.patches:
```

```
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Batsman Name', ylabel='Number of Fifties')
plt.title('Top 3 Batsmen by Most Fifties Scored')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



Bowling Stats - ODI Cricket WorldCup 2023

[67]:
```
df_bowling_summary.head()
```

[67]:
```
   Match_no           Match_Between Bowling_Team       Bowler_Name  Overs  \
0         1  England vs New Zealand  New Zealand       Trent Boult   10.0
1         1  England vs New Zealand  New Zealand        Matt Henry   10.0
2         1  England vs New Zealand  New Zealand  Mitchell Santner   10.0
3         1  England vs New Zealand  New Zealand     Jimmy Neesham    7.0
4         1  England vs New Zealand  New Zealand   Rachin Ravindra   10.0

   Maidens  Runs  Wickets  Economy  Total_Balls
0        1    48        1      4.8           60
1        1    48        3      4.8           60
2        0    37        2      3.7           60
3        0    56        0      8.0           42
4        0    76        1      7.6           60
```

[68]:
```
df_bowling_summary.shape
```

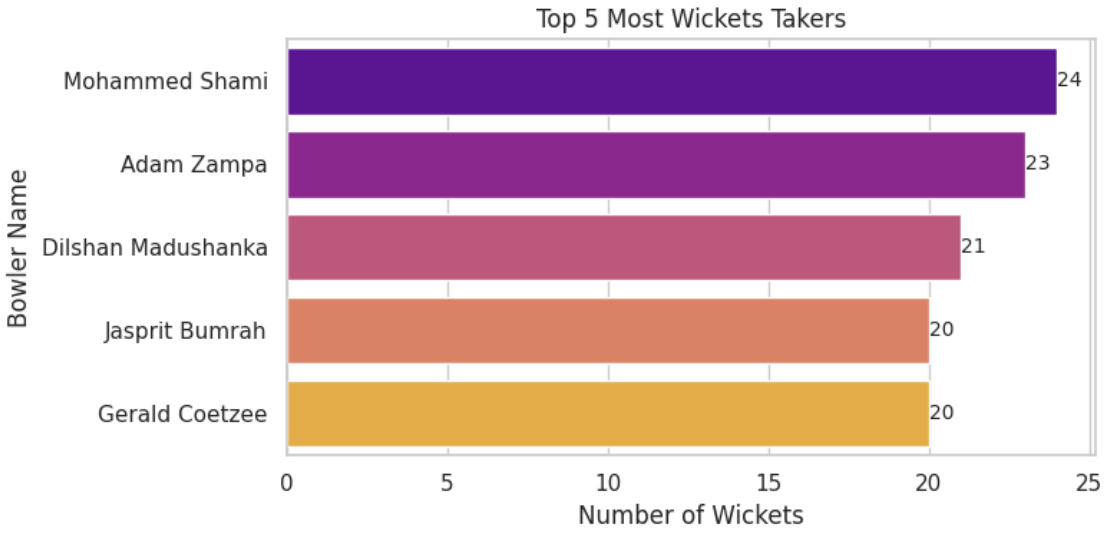
[68]:
```
(574, 10)
```

1. **Top wicket-takers**

[69]:
```
# Create DataFrame for total wickets taken by each bowler
df_wicket_takers = pd.DataFrame(df_bowling_summary.
 ↪groupby(["Bowler_Name"])["Wickets"].sum()).reset_index()

# Sort DataFrame by the total number of wickets in descending order
df_top_wicket_takers = df_wicket_takers.sort_values(by='Wickets',␣
 ↪ascending=False)

# Display the top 5 bowlers by the total number of wickets
# df_top_wicket_takers.head(5)
```

[70]:
```
# Select the top 5 bowlers by the total number of wickets
df = df_top_wicket_takers.head(5)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a horizontal bar graph using Seaborn
plt.figure(figsize=(8, 4))
ax = sns.barplot(x='Wickets', y='Bowler_Name', data=df, palette='plasma',␣
 ↪orient='h')
```

```
# Add labels to the bars
ax.bar_label(ax.containers[0], fontsize=10)

# Set plot labels and title
ax.set(xlabel='Number of Wickets', ylabel='Bowler Name')
plt.title('Top 5 Most Wickets Takers')

# Adjust x-axis labels for better readability
plt.xticks(rotation=0, ha='center')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



2. **Most Balls bowled**

[71]:
```
df_bowling_summary.head()
```

[71]:

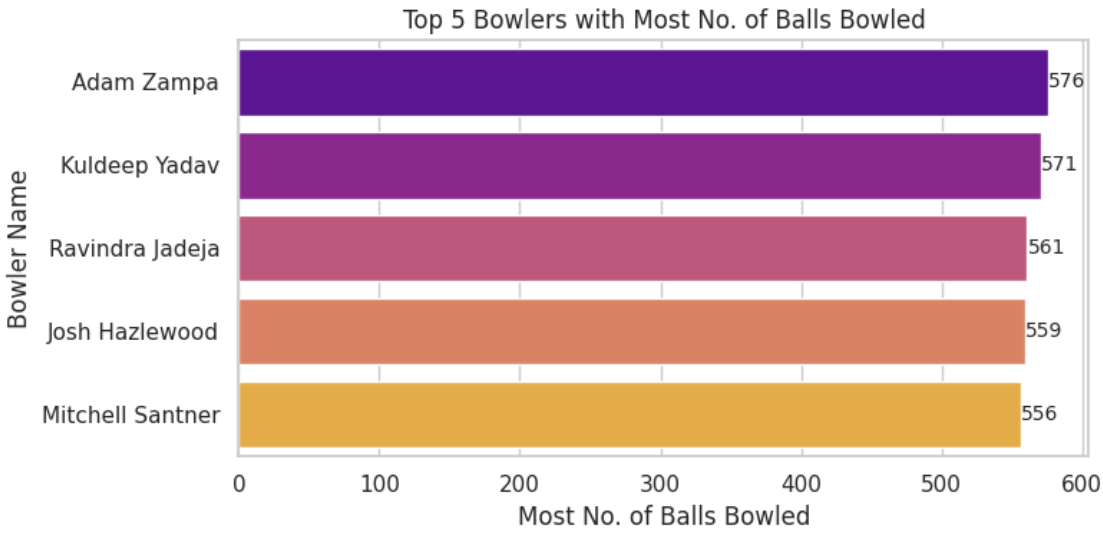
	Match_no	Match_Between	Bowling_Team	Bowler_Name	Overs	\
0	1	England vs New Zealand	New Zealand	Trent Boult	10.0	
1	1	England vs New Zealand	New Zealand	Matt Henry	10.0	
2	1	England vs New Zealand	New Zealand	Mitchell Santner	10.0	
3	1	England vs New Zealand	New Zealand	Jimmy Neesham	7.0	
4	1	England vs New Zealand	New Zealand	Rachin Ravindra	10.0	

	Maidens	Runs	Wickets	Economy	Total_Balls
0	1	48	1	4.8	60
1	1	48	3	4.8	60

```
2          0     37          2       3.7             60
3          0     56          0       8.0             42
4          0     76          1       7.6             60
```

[72]:
```
# Create DataFrame for the total number of balls bowled by each bowler (top 5)
df_most_balls_bowled = pd.DataFrame(df_bowling_summary.
 ↪groupby(["Bowler_Name"])["Total_Balls"].sum().nlargest(5)).reset_index()
```

[73]:
```
# Select the top 5 bowlers with the most number of balls bowled
df = df_most_balls_bowled

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a horizontal bar graph using Seaborn
plt.figure(figsize=(8, 4))
ax = sns.barplot(x='Total_Balls', y='Bowler_Name', data=df, palette='plasma',␣
 ↪orient='h')

# Add labels to the bars
ax.bar_label(ax.containers[0], fontsize=10)

# Set plot labels and title
ax.set(xlabel='Most No. of Balls Bowled', ylabel='Bowler Name')
plt.title('Top 5 Bowlers with Most No. of Balls Bowled')

# Adjust x-axis labels for better readability
plt.xticks(rotation=0, ha='center')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



3. **Best bowling averages**

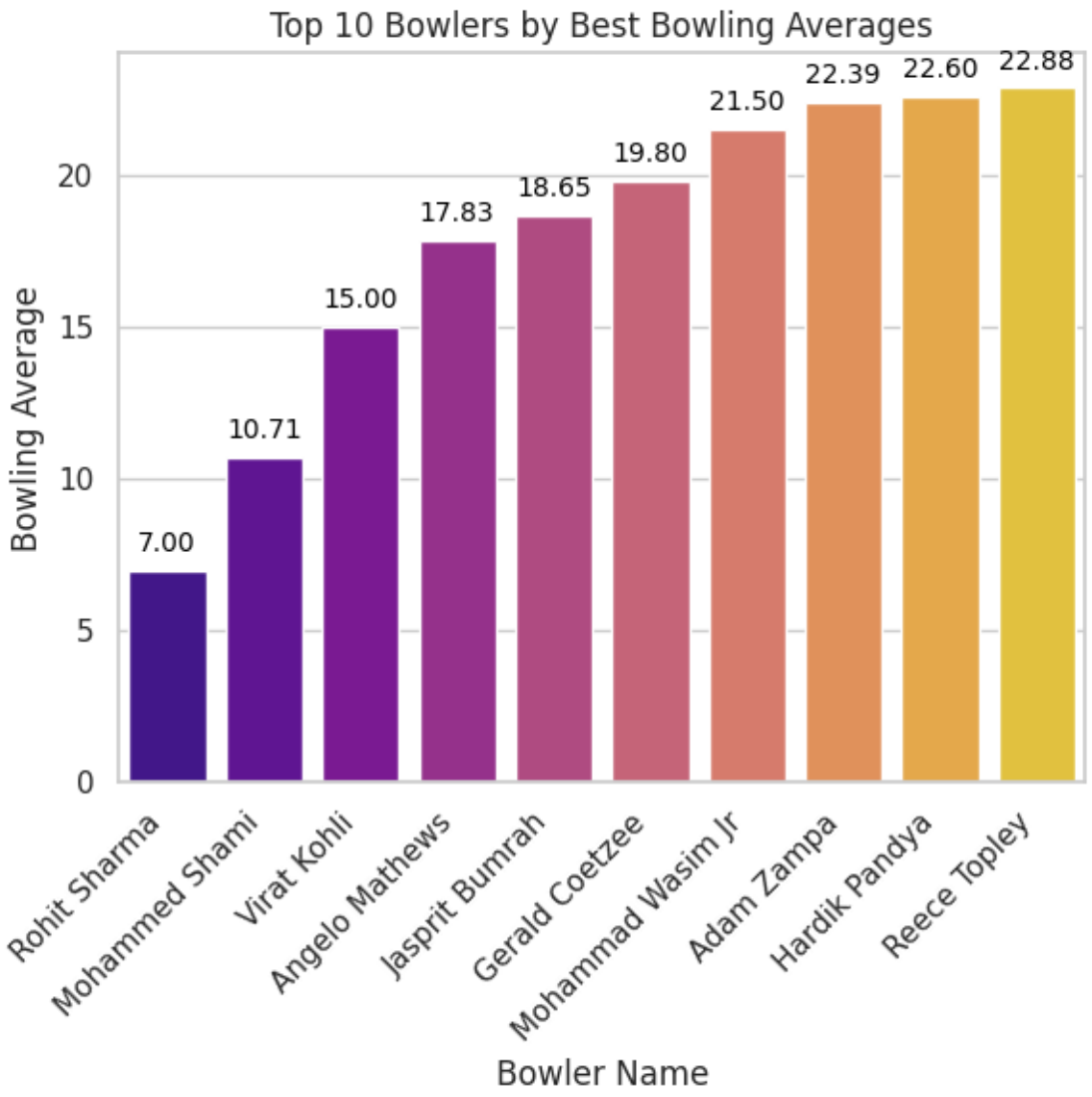
[74]:
```
df_bowling_summary.head()
```

[74]:
```
   Match_no           Match_Between Bowling_Team       Bowler_Name  Overs  \
0         1  England vs New Zealand  New Zealand       Trent Boult   10.0
1         1  England vs New Zealand  New Zealand        Matt Henry   10.0
2         1  England vs New Zealand  New Zealand  Mitchell Santner   10.0
3         1  England vs New Zealand  New Zealand     Jimmy Neesham    7.0
4         1  England vs New Zealand  New Zealand   Rachin Ravindra   10.0

   Maidens  Runs  Wickets  Economy  Total_Balls
0        1    48        1      4.8           60
1        1    48        3      4.8           60
2        0    37        2      3.7           60
3        0    56        0      8.0           42
4        0    76        1      7.6           60
```

[75]:
```
# Calculate total runs and total wickets for each bowler
bowler_stats = df_bowling_summary.groupby("Bowler_Name").agg({
    'Runs': 'sum',
    'Wickets': 'sum',
    'Match_no': 'count'  # Counting the total matches played by each bowler
})

bowler_stats = bowler_stats.reset_index()

# Calculate bowling average for each bowler
bowler_stats['Bowling_Average'] = bowler_stats['Runs'] / bowler_stats['Wickets']
```

```
# Sort values by Bowling_Average
bowler_stats = bowler_stats.sort_values(by="Bowling_Average")
```

[76]:
```
# Select the top 10 bowlers by the best bowling averages
df = bowler_stats.head(10)

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(6, 6))
ax = sns.barplot(x='Bowler_Name', y='Bowling_Average', data=df,␣
 ↪palette='plasma')

# Annotate each bar with its value
for p in ax.patches:
    ax.annotate(f'{p.get_height():.2f}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Bowler Name', ylabel='Bowling Average')
plt.title('Top 10 Bowlers by Best Bowling Averages')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```



4. **Most Economical Bowlers**

[77]:
```
df_bowling_summary.head()
```

[77]:

	Match_no	Match_Between	Bowling_Team	Bowler_Name	Overs	Maidens	Runs	Wickets	Economy	Total_Balls
0	1	England vs New Zealand	New Zealand	Trent Boult	10.0	1	48	1	4.8	60
1	1	England vs New Zealand	New Zealand	Matt Henry	10.0					
2	1	England vs New Zealand	New Zealand	Mitchell Santner	10.0					
3	1	England vs New Zealand	New Zealand	Jimmy Neesham	7.0					
4	1	England vs New Zealand	New Zealand	Rachin Ravindra	10.0					

```
1        1    48        3      4.8          60
2        0    37        2      3.7          60
3        0    56        0      8.0          42
4        0    76        1      7.6          60
```

[78]:
```
# Create DataFrame for the average economy rate of each bowler
df_no_matches_BP = pd.DataFrame(df_bowling_summary.
 ↪groupby(["Bowler_Name"])["Economy"].mean()).reset_index()

# Sort DataFrame by the average economy rate in ascending order
df_no_matches_BP = df_no_matches_BP.sort_values(by="Economy")
```

[79]:
```
df_no_matches_BP.head(1)
```

[79]:
```
            Bowler_Name  Economy
76  Ravichandran Ashwin      3.4
```

- Highest Economical Bowler: **3.40 (Economy Rate)**
- Batsman Name: **Ravichandran Ashwin**

Players Stats - ODI Cricket WorldCup 2023

[80]:
```
new_df_world_cup_players.shape
```

[80]:
```
(151, 5)
```

[81]:
```
new_df_world_cup_players.head()
```

[81]:
```
       player_name    team_name    battingStyle            bowlingStyle  \
0   Jonny Bairstow      England  Right-hand bat   Right-arm fast-medium
1        Joe Root      England  Right hand Bat      Right arm Offbreak
2     Jos Buttler      England  Right hand Bat
3      Will Young  New Zealand  Right hand Bat      Right arm Offbreak
4  Rachin Ravindra  New Zealand   Left hand Bat  Slow Left arm Orthodox

           playingRole
0  Wicketkeeper Batter
1     Top order Batter
2  Wicketkeeper Batter
3     Top order Batter
4     Top order Batter
```

[82]:
```
# Count the total number of occurrences of each player name in the␣
 ↪'player_name' column
total_player_count = new_df_world_cup_players.
 ↪groupby(['player_name'])['player_name'].count().sum()
total_player_count
```

[82]: 151

- Total Playes Played in ODI CWC 2023: **151 (Players)**

Matches Stats - ODI Cricket WorldCup 2023

[83]:
```
df_match_schedule_results.head()
```

[83]:

	Match_no	Date	Venue	Team1	Team2	Winner	Scorecard URL
0	1	October 5	Ahmedabad	England	New Zealand	New Zealand	https://www.cricketwa.com/scorecard/18020/engl…
1	2	October 6	Hyderabad	Pakistan	Netherlands	Pakistan	https://www.cricketwa.com/scorecard/18021/paki…
2	3	October 7	Dharamsala	Bangladesh	Afghanistan	Bangladesh	https://www.cricketwa.com/scorecard/23008/bang…
3	4	October 7	Delhi	South Africa	Sri Lanka	South Africa	https://www.cricketwa.com/scorecard/23009/sout…
4	5	October 8	Chennai	India	Australia	India	https://www.cricketwa.com/scorecard/23010/indi…

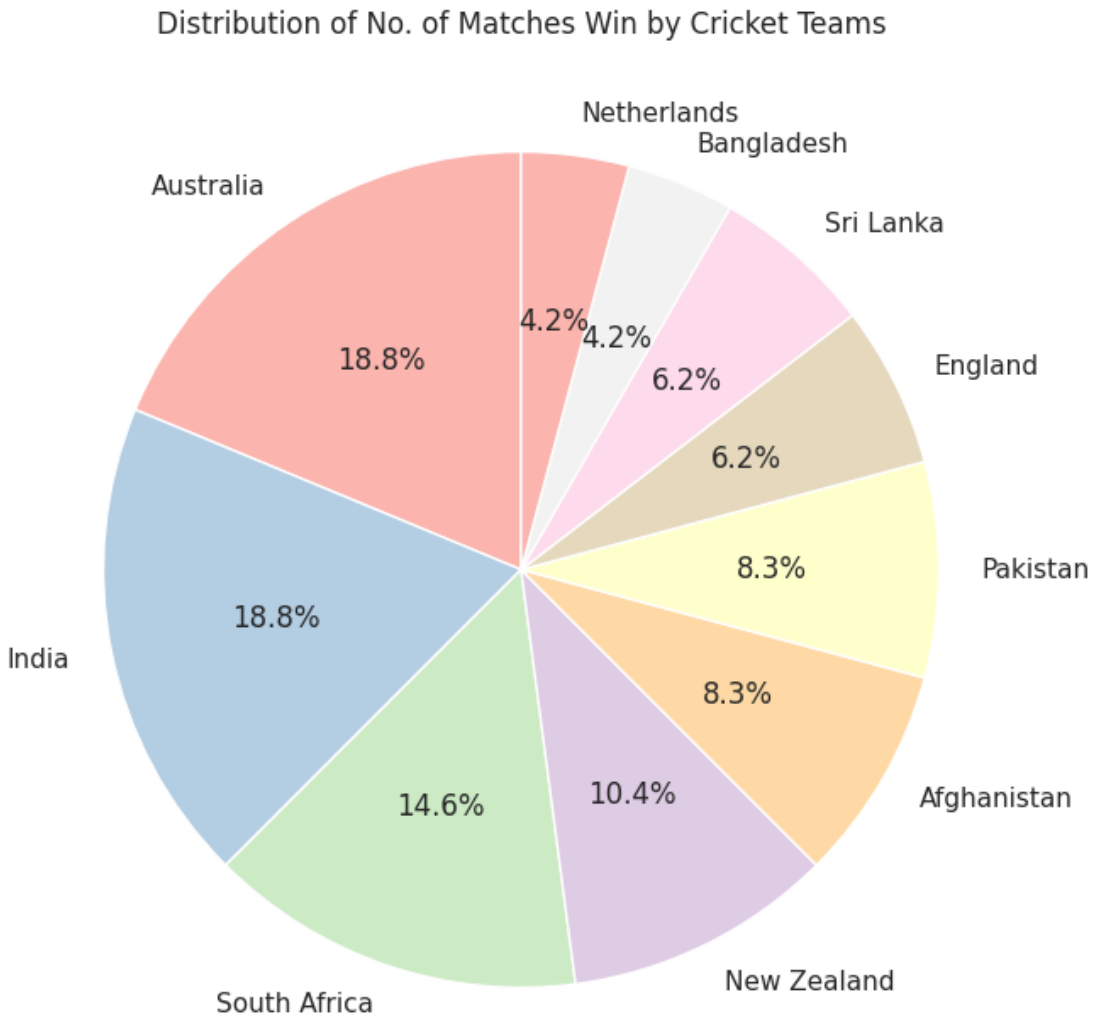
[84]:
```
# Count the total number of matches in the 'Match_no' column
total_matches_count = df_match_schedule_results['Match_no'].count()
total_matches_count
```

[84]: 48

- Total Matches Played in ODI CWC 2023: **48 (Matches)**

[85]:
```
# Create DataFrame for the count of matches won by each team
df_matche_wins = df_match_schedule_results.groupby(['Winner'])['Match_no'].
 ↪count()

# Convert the Series to a DataFrame and reset index
df_matche_wins = pd.DataFrame(df_matche_wins).reset_index()

# Sort DataFrame by the count of matches won in descending order
df_matche_wins = df_matche_wins.sort_values(by="Match_no", ascending=False)
```

[86]:
```
# Plot a pie chart for the distribution of matches won by cricket teams
plt.figure(figsize=(8, 8))
plt.pie(df_matche_wins['Match_no'], labels=df_matche_wins['Winner'],␣
 ↪autopct='%1.1f%%', colors=plt.cm.Pastel1.colors, startangle=90)
plt.title('Distribution of No. of Matches Win by Cricket Teams')
plt.show()
```



[87]:
```
# Select the DataFrame for plotting
df = df_matche_wins

# Set Seaborn style
sns.set(style="whitegrid")

# Plot a bar graph using Seaborn
plt.figure(figsize=(10, 5))
ax = sns.barplot(x='Winner', y='Match_no', data=df, palette='magma', width=0.8)

# Annotate each bar with its value
for p in ax.patches:
```

```
    ax.annotate(f'{int(p.get_height())}', (p.get_x() + p.get_width() / 2., p.
 ↪get_height()),
                ha='center', va='center', xytext=(0, 10), textcoords='offset␣
 ↪points', fontsize=10, color='black')

# Set plot labels and title
ax.set(xlabel='Winner Team', ylabel='Matches Win')
plt.title('No. Matches Win by Each Team')

# Adjust x-axis labels for better readability
plt.xticks(rotation=45, ha='right')

# Adjust layout and display the plot
plt.tight_layout()
plt.show()
```