Samanta_Rajib_DSCT301_Project_IPL_2022

June 3, 2023

[183]:
```
# Assignment Term Project: IPL 2022 EDA Analysis
```

[184]:
```
from os.path import basename, exists
def download(url):
    filename = basename(url)
    if not exists(filename):
        from urllib.request import urlretrieve

        local, _ = urlretrieve(url, filename)
        print("Downloaded " + local)
download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/
 ↪thinkstats2.py")
download("https://github.com/AllenDowney/ThinkStats2/raw/master/code/thinkplot.
 ↪py")
download("https://github.com/usamara/DSC530/blob/main/Book_ipl22_ver_33.csv")
```

[185]:
```
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import seaborn as sns
import matplotlib.pyplot as plt
from scipy import stats
import random
import thinkplot
import thinkstats2
import warnings
import plotly.express as px
import plotly.graph_objects as go
import statsmodels.formula.api as smf
warnings.filterwarnings('ignore')

import os
```

[186]:
```
#ipl_data = pd.read_csv("/kaggle/input/ipl-2022dataset/Book_ipl22_ver_33.csv")
ipl_data = pd.read_csv("/Users/rajibsamanta/Documents/Rajib/College/Sem4_2023/
 ↪Project/Book_ipl22_ver_33.csv",encoding ='unicode_escape')
# to avoid encoding error use unicode_escape parameter
ipl_data.head()
```

[186]:
	match_id	date	venue
0	1	March 26,2022	Wankhede Stadium, Mumbai
1	2	March 27,2022	Brabourne Stadium, Mumbai
2	3	March 27,2022	Dr DY Patil Sports Academy, Mumbai
3	4	March 28,2022	Wankhede Stadium, Mumbai
4	5	March 29,2022	Maharashtra Cricket Association Stadium,Pune

	team1	team2	stage	toss_winner	toss_decision	first_ings_score
0	Chennai	Kolkata	Group	Kolkata	Field	131
1	Delhi	Mumbai	Group	Delhi	Field	177
2	Banglore	Punjab	Group	Punjab	Field	205
3	Gujarat	Lucknow	Group	Gujarat	Field	158
4	Hyderabad	Rajasthan	Group	Hyderabad	Field	210

	first_ings_wkts	second_ings_score	second_ings_wkts	match_winner	won_by
0	5	133	4	Kolkata	Wickets
1	5	179	6	Delhi	Wickets
2	2	208	5	Punjab	Wickets
3	6	161	5	Gujarat	Wickets
4	6	149	7	Rajasthan	Runs

	margin	player_of_the_match	top_scorer	highscore	best_bowling
0	6	Umesh Yadav	MS Dhoni	50	Dwayne Bravo
1	4	Kuldeep Yadav	Ishan Kishan	81	Kuldeep Yadav
2	5	Odean Smith	Faf du Plessis	88	Mohammed Siraj
3	5	Mohammed Shami	Deepak Hooda	55	Mohammed Shami
4	61	Sanju Samson	Aiden Markram	57	Yuzvendra Chahal

	best_bowling_figure
0	3--20
1	3--18
2	2--59
3	3--25
4	3--22

[187]:
```
# Important variables
## The dataset contains all the information needed to summarize the story of␣
 ↪IPL 2022 so far.
## Here are key variables
## Venue --> Matched played on Stadium
## team1 --> First Team ,team2--> opponent team
## first_ings_score --> fisrt batting team score ,first_ings_wkts--> fisrt␣
 ↪batting team loose wicket to score
## second_ings_score --> 2nd batting team score , second_ings_wkts--> 2nd␣
 ↪batting team loose wicket to score
## match_winner --> Team win the match
## player_of_the_match --> Best player of the match
```

[188]:
```
# Data Cleaning
ipl_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 74 entries, 0 to 73
Data columns (total 20 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   match_id             74 non-null     int64
 1   date                 74 non-null     object
 2   venue                74 non-null     object
 3   team1                74 non-null     object
 4   team2                74 non-null     object
 5   stage                74 non-null     object
 6   toss_winner          74 non-null     object
 7   toss_decision        74 non-null     object
 8   first_ings_score     74 non-null     int64
 9   first_ings_wkts      74 non-null     int64
 10  second_ings_score    74 non-null     int64
 11  second_ings_wkts     74 non-null     int64
 12  match_winner         74 non-null     object
 13  won_by               74 non-null     object
 14  margin               74 non-null     int64
 15  player_of_the_match  74 non-null     object
 16  top_scorer           74 non-null     object
 17  highscore            74 non-null     int64
 18  best_bowling         74 non-null     object
 19  best_bowling_figure  74 non-null     object
dtypes: int64(7), object(13)
memory usage: 11.7+ KB
```

[189]:
```
# Check for null
ipl_data.isna().sum()
```

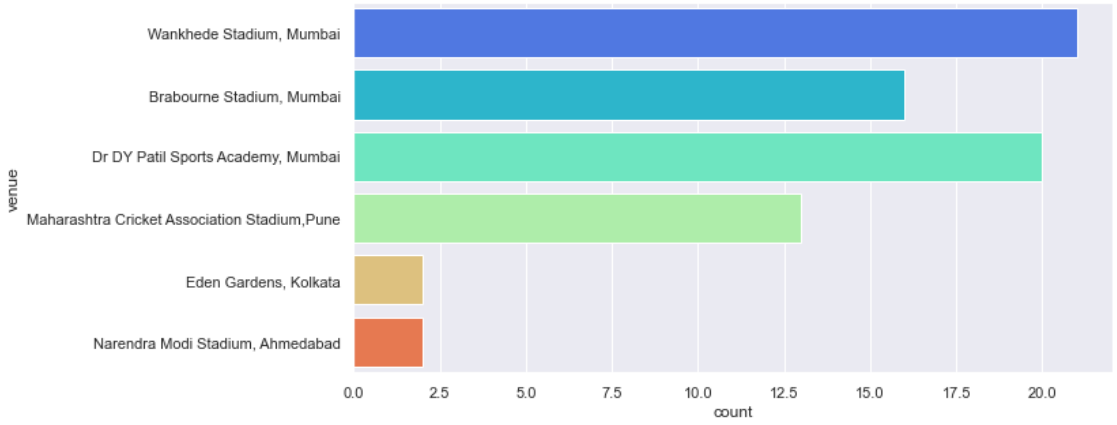
[189]:
```
match_id              0
date                  0
venue                 0
team1                 0
team2                 0
stage                 0
toss_winner           0
toss_decision         0
first_ings_score      0
first_ings_wkts       0
second_ings_score     0
second_ings_wkts      0
match_winner          0
won_by                0
```

```
margin                  0
player_of_the_match     0
top_scorer              0
highscore               0
best_bowling            0
best_bowling_figure     0
dtype: int64
```

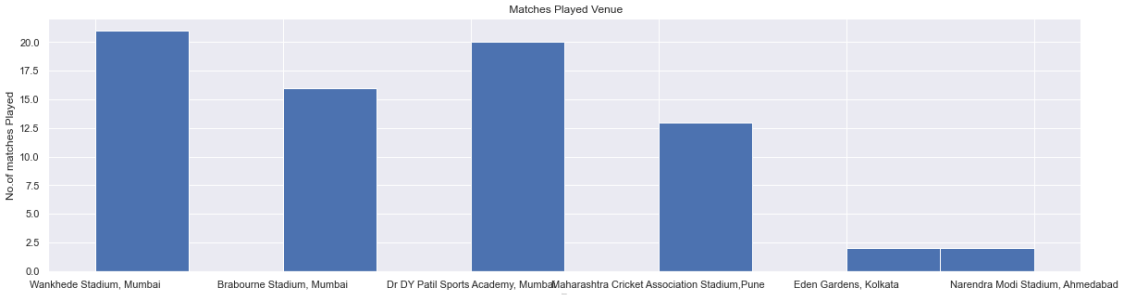
[190]:
```
# There is no null value column , so no need to drop or transform any row
## All column holds some information , no unrelated column , so no need to drop␣
 ↪any column
```

[191]:
```
# Plot histogram for important variables
# variable =venue
sns.countplot(y='venue',data=ipl_data,palette='rainbow')
# The below hitrogram plot shows more matches were conducted on wankhede mumbai
```

[191]:
```
<AxesSubplot:xlabel='count', ylabel='venue'>
```

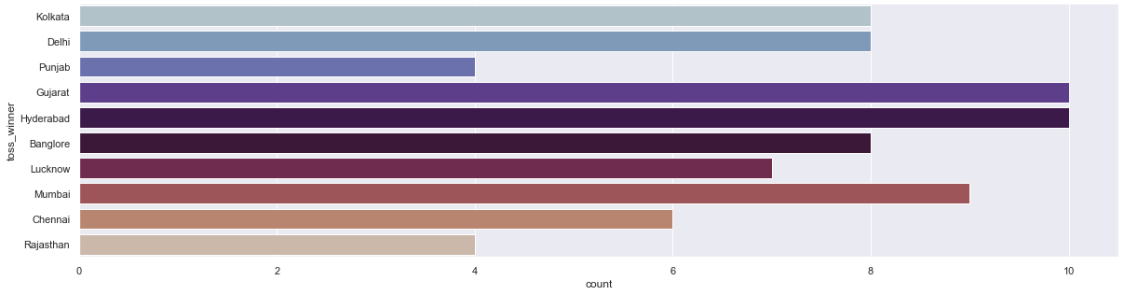


[192]:
```
# histogram for venue using matplotlib
params = {'figure.figsize': (20, 5)}
plt.rcParams.update(params)
plt.hist(ipl_data['venue'])
plt.xlabel("Stadium/Venue",fontsize=1)
plt.ylabel("No.of matches Played")
plt.title(" Matches Played Venue")
plt.show()
```

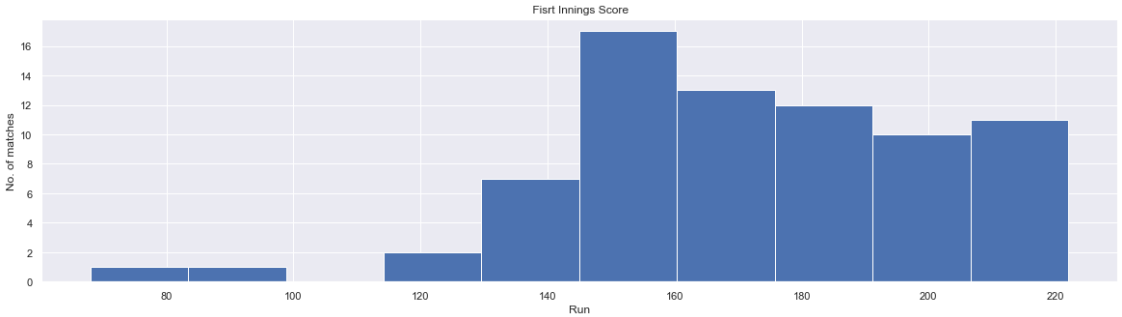


[193]:
```
# Toss winner Histogram
sns.countplot(y='toss_winner',data=ipl_data,palette='twilight')
#The below plot shows that more tosses were won by Gujarat and Hyderabad
```

[193]: <AxesSubplot:xlabel='count', ylabel='toss_winner'>

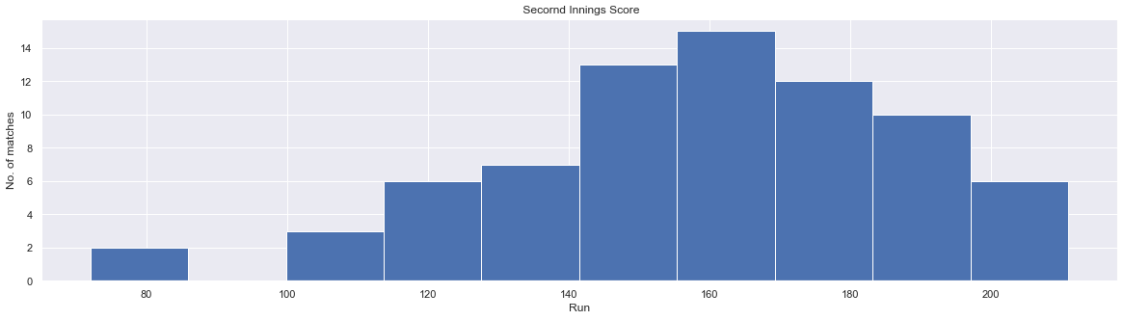


[194]:
```
# histogram for first_ings_score using matplotlib
plt.hist(ipl_data['first_ings_score'])
plt.xlabel("Run")
plt.ylabel("No. of matches")
plt.title(" Fisrt Innings Score")
plt.show()
```



[195]:
```
# Above histogram shows that first innings score mostly between 110 to 220 ,␣
↪below 100 we can consider as outlier
```

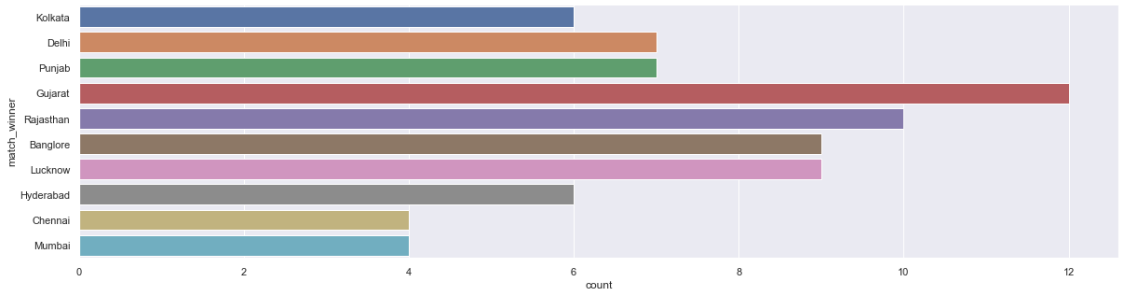
[196]:
```
# histogram for second_ings_score using matplotlib
plt.hist(ipl_data['second_ings_score'])
plt.xlabel("Run")
plt.ylabel("No. of matches")
plt.title(" Secornd Innings Score")
plt.show()
```



[197]:
```
# Above histogram shows that 2nd innings score mostly between 110 to 220 ,␣
↪below 100 we can consider as outlier
```

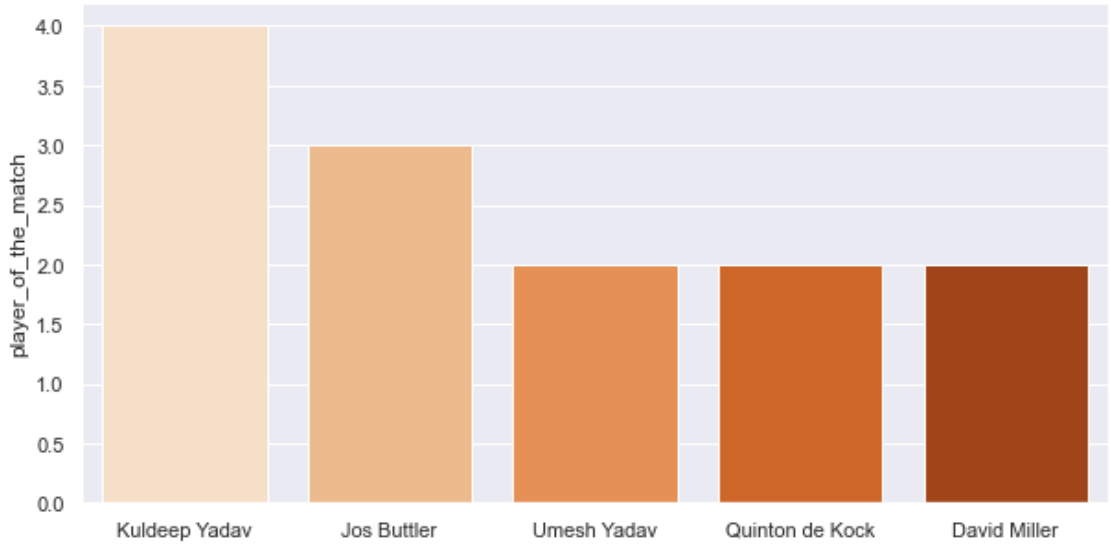
[198]:
```
# Match winner histogram sns plot
sns.countplot(y='match_winner',data=ipl_data)
# As per below plot Gujarat has won the most matches
```

[198]:
```
<AxesSubplot:xlabel='count', ylabel='match_winner'>
```



[199]:
```
# top player barplot
# set chart size to display text properly
sns.set(rc={'figure.figsize':(10,5)})
sns.barplot(y=TOP_5_players,x=TOP_5_players.index,palette='Oranges')
```

[199]: <AxesSubplot:ylabel='player_of_the_match'>



[200]:
```
# The Above graph show that top player maximum player of the match winner ,␣
 ↪Kuldeep Yadav score higesht in this category
```

[201]:
```
# Determine descriptive characteristics about the variables: Mean, Mode,␣
 ↪Spread, and Tails .
ipl_data.describe()
```

[201]:

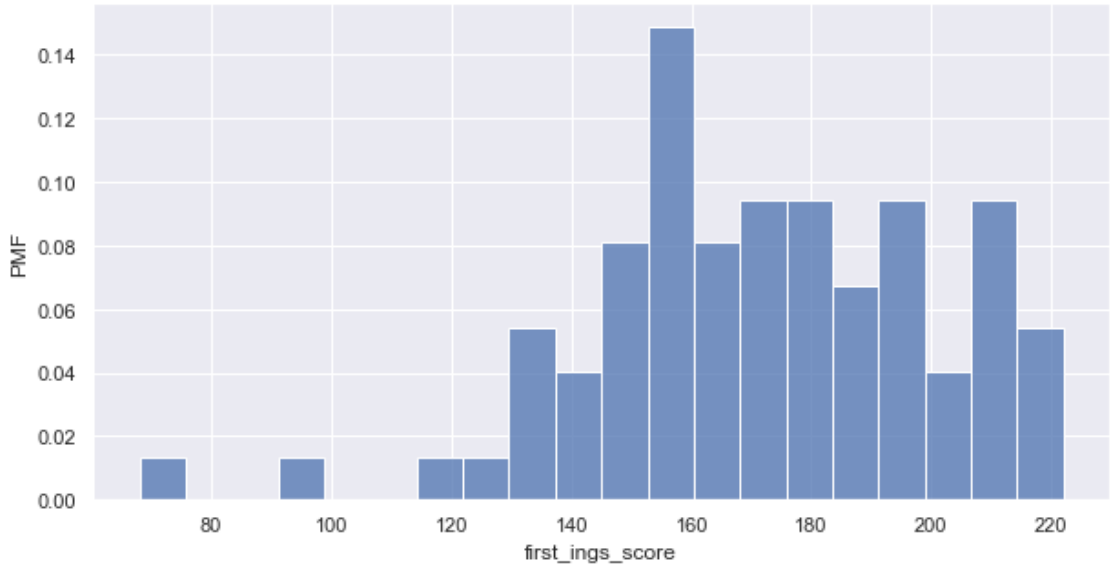
	match_id	first_ings_score	first_ings_wkts	second_ings_score	second_ings_wkts	margin	highscore
count	74.000000	74.000000	74.000000	74.000000	74.000000	74.000000	74.000000
mean	37.500000	171.121622	6.135135	158.540541	6.175676	16.972973	71.716216
std	21.505813	29.048355	2.222699	29.299207	2.639832	19.651047	20.705052
min	1.000000	68.000000	0.000000	72.000000	1.000000	2.000000	28.000000
25%	19.250000	154.250000	5.000000	142.750000	4.000000	5.250000	57.000000
50%	37.500000	169.500000	6.000000	160.000000	6.000000	8.000000	68.000000
75%	55.750000	192.750000	8.000000	176.000000	8.000000	18.000000	87.750000
max	74.000000	222.000000	10.000000	211.000000	10.000000	91.000000	140.000000

[202]:
```
ipl_data['first_ings_score'].mode()
```

[202]:
```
0    169
1    177
2    189
3    210
Name: first_ings_score, dtype: int64
```

[203]:
```
# The above varibles descriptive characteristics shows that 75% matches first innings score is around 192 where as 2nd innings score is 176.Highest score for individual player around 87 run.
```

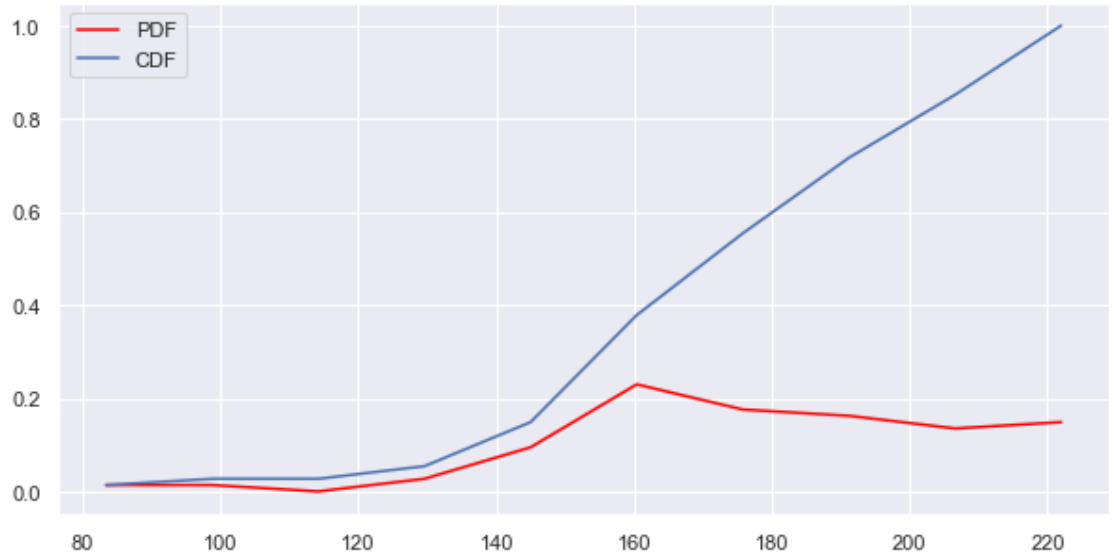
[204]:
```
# Determine PMF( Probability Mass function) for first_ings_score
plt.ylabel('PMF')
sns.histplot(ipl_data['first_ings_score'], stat='probability', bins=20);
```



[205]:
```
# Determine PDF(Probability Distribution Function) & CDF(cumulative distribution function) for first_ings_score
# initializing  values
data = ipl_data['first_ings_score']
# getting data of the histogram
count, bins_count = np.histogram(data, bins=10)
# finding the PDF of the histogram using count values
pdf = count / sum(count)
# using numpy np.cumsum to calculate the CDF
# We can also find using the PDF values by looping and adding
cdf = np.cumsum(pdf)
# plotting PDF and CDF
```

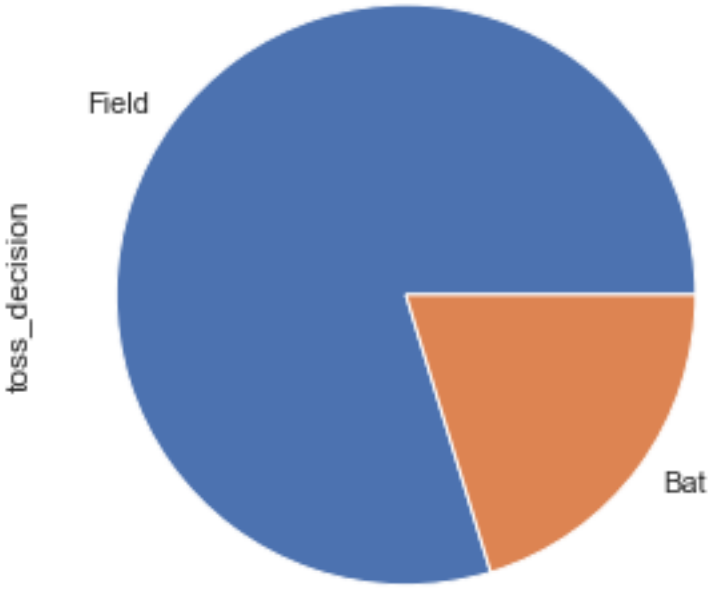
```
plt.plot(bins_count[1:], pdf, color="red", label="PDF")
plt.plot(bins_count[1:], cdf, label="CDF")
plt.legend()
```

[205]: <matplotlib.legend.Legend at 0x7f8ed889d310>



[206]:
```
# analytical distribution
ipl_data['toss_decision'].value_counts().plot.pie(figsize=(5,5))
# As per below plot Fielding was chosen the most by toss-winners
```

[206]: <AxesSubplot:ylabel='toss_decision'>



[207]:
```
# The number of matches won by each team in IPL 2022
figure = px.bar(ipl_data, x=ipl_data["match_winner"],
            title="Number of Matches Won in IPL 2022")
figure.show()
```

[208]:
```
# So, currently, Gujrat is leading the tournament by winning eight matches. It␣
 ↪is an achievement as a new team for Gujrat in IPL
```

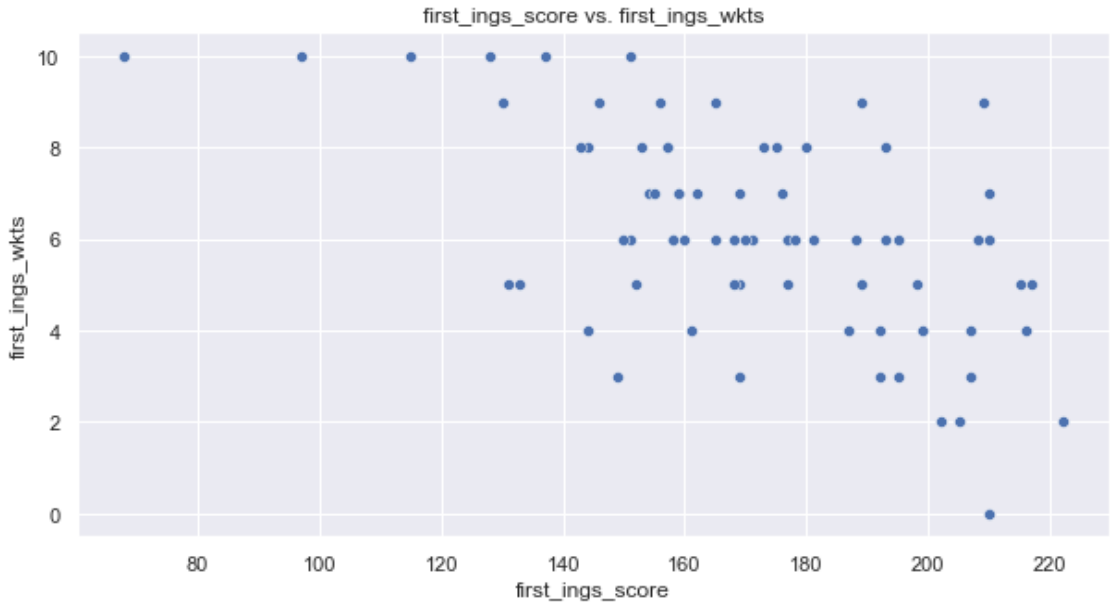
[209]:
```
#  Here we will analyze whether most of the teams win by defending (batting␣
 ↪first) or chasing (batting second)
ipl_data["won_by"] = ipl_data["won_by"].map({"Wickets": "Chasing","Runs":␣
 ↪"Defending"})
won_by = ipl_data["won_by"].value_counts()
# won_by
label = won_by.index
counts = won_by.values
colors = ['blue','lightgreen']

fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_traces(hoverinfo='label+percent', textinfo='value',
                  textfont_size=20,
                  marker=dict(colors=colors,
                              line=dict(color='black', width=3)))
```

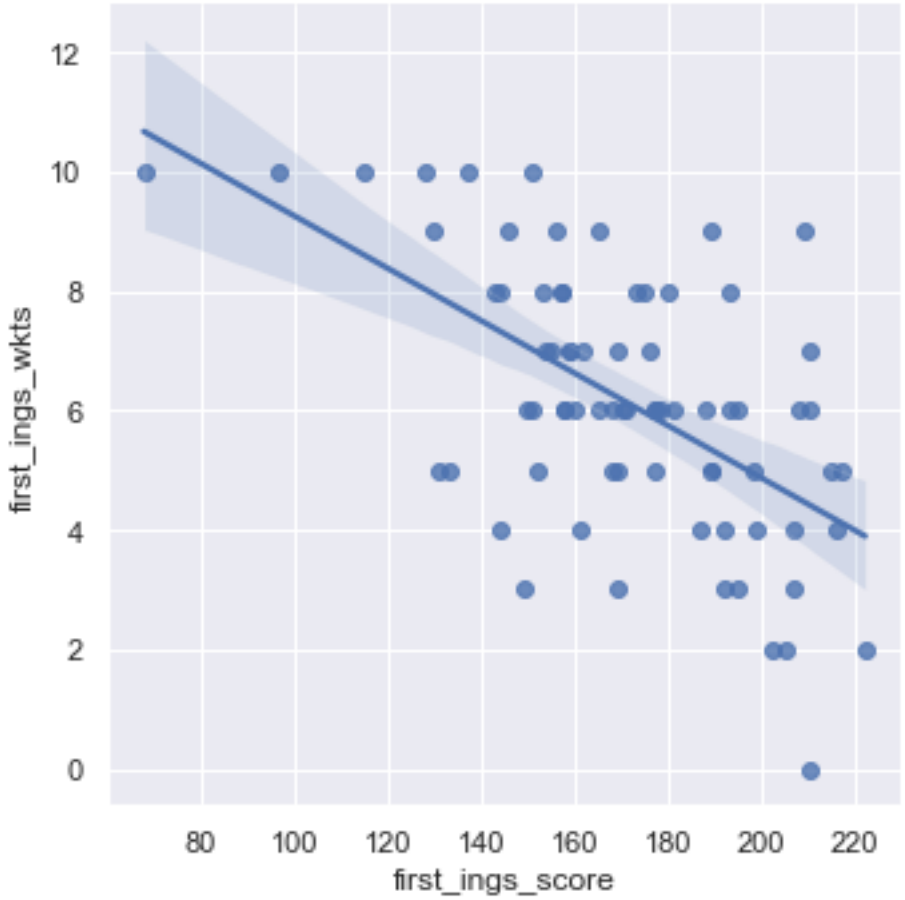
```
fig.show()
# Winning chance batting first or 2nd is same (50%)
```

[210]:
```
# look at whether most of the wickets fall while setting the target or while␣
 ↪chasing the target:
figure = go.Figure()
figure.add_trace(go.Bar(
    x=ipl_data["venue"],
    y=ipl_data["first_ings_wkts"],
    name='First Innings Wickets',
    marker_color='gold'
))
figure.add_trace(go.Bar(
    x=ipl_data["venue"],
    y=ipl_data["second_ings_wkts"],
    name='Second Innings Wickets',
    marker_color='lightgreen'
))
figure.update_layout(barmode='group', xaxis_tickangle=-45)
figure.show()
```

[211]:
```
# So in the Wankhede Stadium in Mumbai and MCA Stadium in Pune, most wickets␣
 ↪fall while chasing the target. And in the other two stadiums, most wickets␣
 ↪fall while setting the target.
```

[212]:
```
## Correlation with Scatter plot for first innigs_score vrs first␣
 ↪innigs_wickets means while setting
## the target with  best-fit line
ax = sns.scatterplot(x="first_ings_score", y="first_ings_wkts", data=ipl_data)
ax.set_title("first_ings_score vs. first_ings_wkts")
ax.set_xlabel("first_ings_score");
sns.lmplot(x="first_ings_score", y="first_ings_wkts", data=ipl_data);
```


first_ings_score vs. first_ings_wkts
first_ings_wkts
first_ings_score
0
2
4
6
8
10
80
100
120
140
160
180
200
220

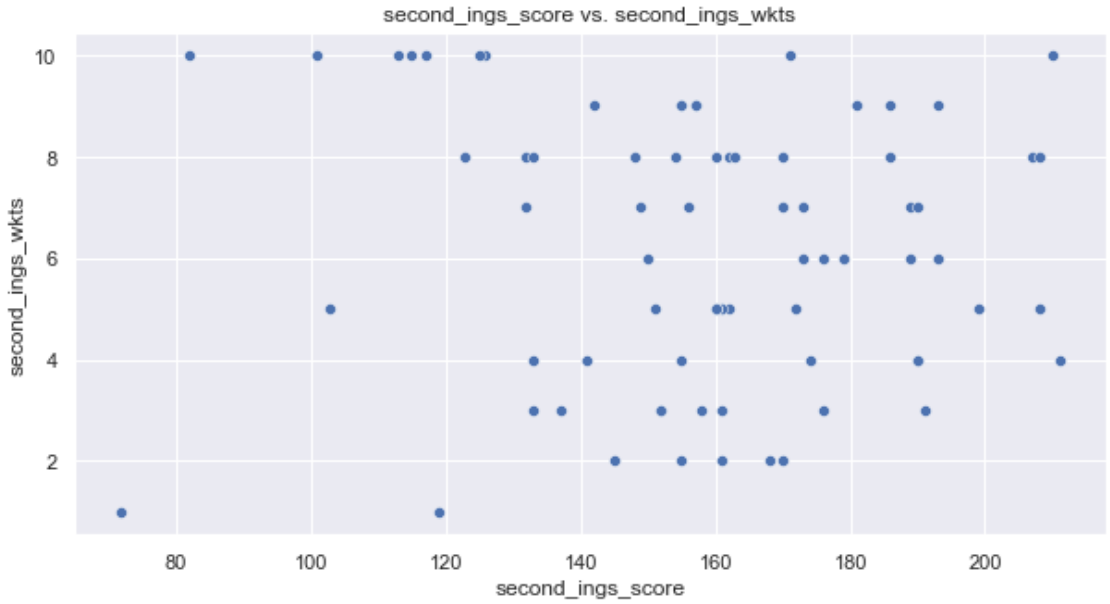

first_ings_wkts
first_ings_score
0
2
4
6
8
10
12
80
100
120
140
160
180
200
220

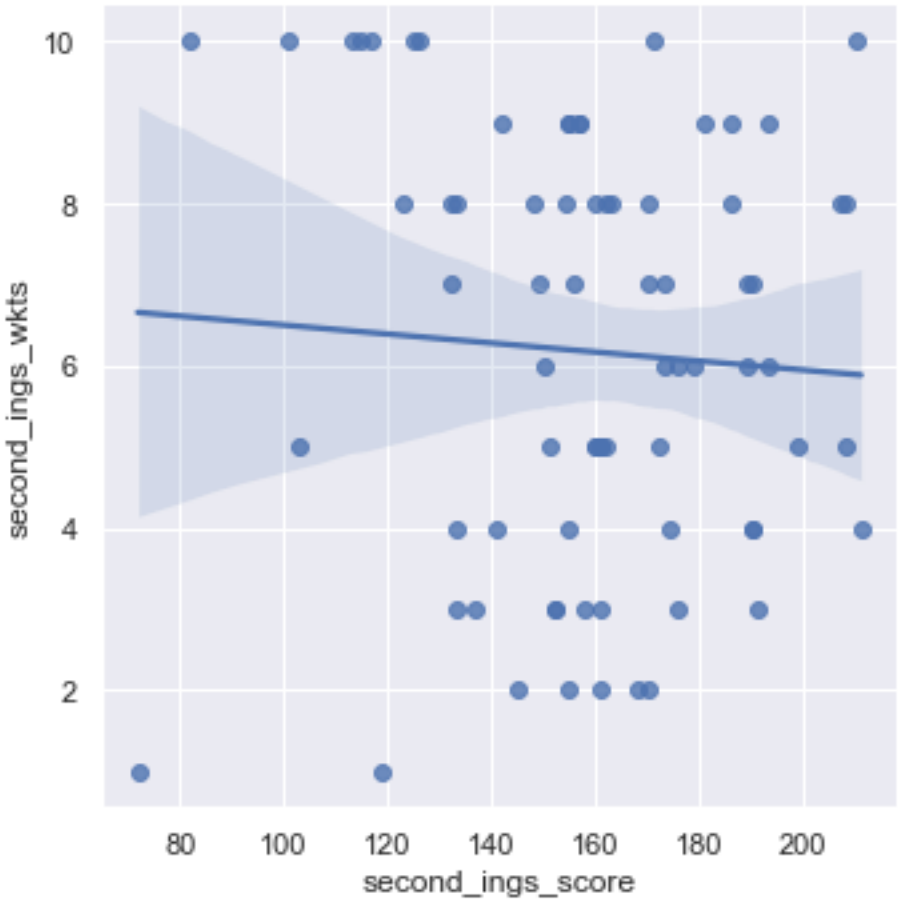
[213]:
```
# Coefficient of correlation
stats.pearsonr(ipl_data['first_ings_score'], ipl_data['first_ings_wkts'])
```

[213]:
```
(-0.5750145215715519, 8.406575080712691e-08)
```

[214]:
```
# We conclude based on this that there is medium ngetive linear relationship␣
 ↪between first_ings_score and
# first_ings_wkts.In other words, it seems that first_ings_wkts does have some␣
 ↪influence on first_ings_score
```

[215]:
```
## Correlation with Scatter plot for 2nd innigs_score vrs 2nd innigs_wickets␣
 ↪means while chasing with  best-fit line
ax = sns.scatterplot(x="second_ings_score", y="second_ings_wkts", data=ipl_data)
ax.set_title("second_ings_score vs. second_ings_wkts")
ax.set_xlabel("second_ings_score");
sns.lmplot(x="second_ings_score", y="second_ings_wkts", data=ipl_data);
```





[216]:
```
# Pearson Coefficient of correlation
stats.pearsonr(ipl_data['second_ings_score'], ipl_data['second_ings_wkts'])
```

[216]:
```
(-0.06163932616910728, 0.6018716734072516)
```

[217]:
```
# We conclude based on this that there is weak ngetive linear relationship␣
 ↪between second_ings_score and second_ings_wkts but not so weak that we␣
 ↪should conclude the variables are uncorrelated. In other words, it seems␣
 ↪that fly ash does have some influence on concrete strength.
```

[218]:
```
cormat = ipl_data.corr()
round(cormat,2)
```

[218]:

	match_id	first_ings_score	first_ings_wkts	\
match_id	1.00	-0.05	0.01	
first_ings_score	-0.05	1.00	-0.58	
first_ings_wkts	0.01	-0.58	1.00	
second_ings_score	-0.14	0.70	-0.51	

```
second_ings_wkts      -0.04              0.49            -0.23
margin                 0.12              0.28            -0.02
highscore              0.06              0.57            -0.56
```

	second_ings_score	second_ings_wkts	margin	highscore
match_id	-0.14	-0.04	0.12	0.06
first_ings_score	0.70	0.49	0.28	0.57
first_ings_wkts	-0.51	-0.23	-0.02	-0.56
second_ings_score	1.00	-0.06	-0.47	0.56
second_ings_wkts	-0.06	1.00	0.60	0.15
margin	-0.47	0.60	1.00	-0.05
highscore	0.56	0.15	-0.05	1.00

[219]:
```
#hypothesis Testing
# perform one sample t-test
# One sample t-test: The One Sample t-test ascertains if the sample average␣
 ↪differs statistically from an actual or apposed population mean.
# A parametric testing technique is the One Sample t-test.
# Let determine the average first innings score is 160 ?
first_ings_score_mean= ipl_data['first_ings_score'].mean()
stats.ttest_1samp(ipl_data['first_ings_score'], 160)
```

[219]:
```
Ttest_1sampResult(statistic=3.293536138648463, pvalue=0.0015275358256629731)
```

[220]:
```
## Since the p-value of the test (0.001527535820) is less than .05, we reject␣
 ↪the null hypothesis.
```

[221]:
```
# regression analysis

# Initialise and fit linear regression model using statsmodels
model = smf.ols('first_ings_wkts ~ first_ings_score', data=ipl_data)
model = model.fit()
```

[222]:
```
# Predict values
first_ings_pred = model.predict()

# Plot regression against actual data
plt.figure(figsize=(12, 6))
plt.plot(ipl_data['first_ings_score'], ipl_data['first_ings_wkts'], 'o')       ␣
 ↪   # scatter plot showing actual data
plt.plot(ipl_data['first_ings_score'], first_ings_pred, 'r', linewidth=1)   #␣
 ↪regression line
plt.xlabel('first_ings_score')
plt.ylabel('first_ings_wkts')
plt.title('first_ings_wkts vs first_ings_score')

plt.show()
```

[223]:
```
# We can see that there is a negetive linear relationship between␣
 ↪first_ings_score and first_ings_wkts - in other words,
# loosing less wickets predicts a higher score!
```

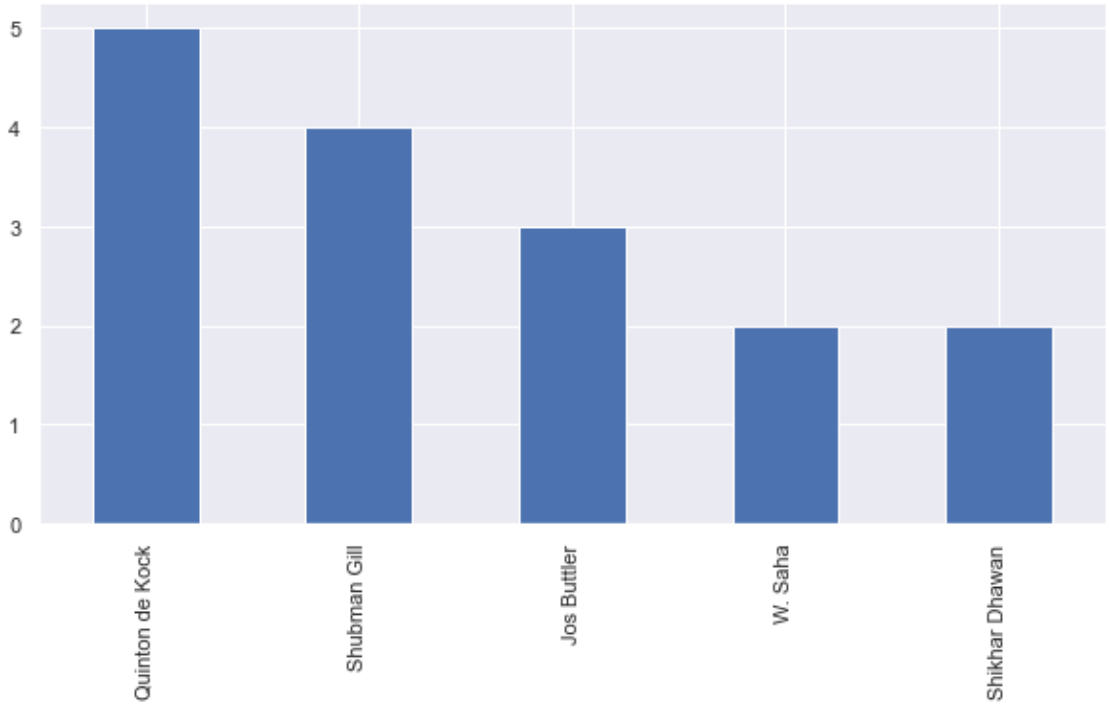
[224]:
```
# Venue list
ipl_data['venue'].unique()
```

[224]:
```
array(['Wankhede Stadium, Mumbai', 'Brabourne Stadium, Mumbai',
       'Dr DY Patil Sports Academy, Mumbai',
       'Maharashtra Cricket Association Stadium,Pune',
       'Eden Gardens, Kolkata', 'Narendra Modi Stadium, Ahmedabad'],
      dtype=object)
```

[225]:
```
# Top scorer
top_scorer=ipl_data.groupby('highscore')['top_scorer'].max()
#top_scorer
```

[226]:
```
#high score with top performance
top_scorer.value_counts().nlargest(5).plot(kind='bar')
# As per below plot Quinton de Kock has the high score with top performance
```

[226]:
```
<AxesSubplot:>
```

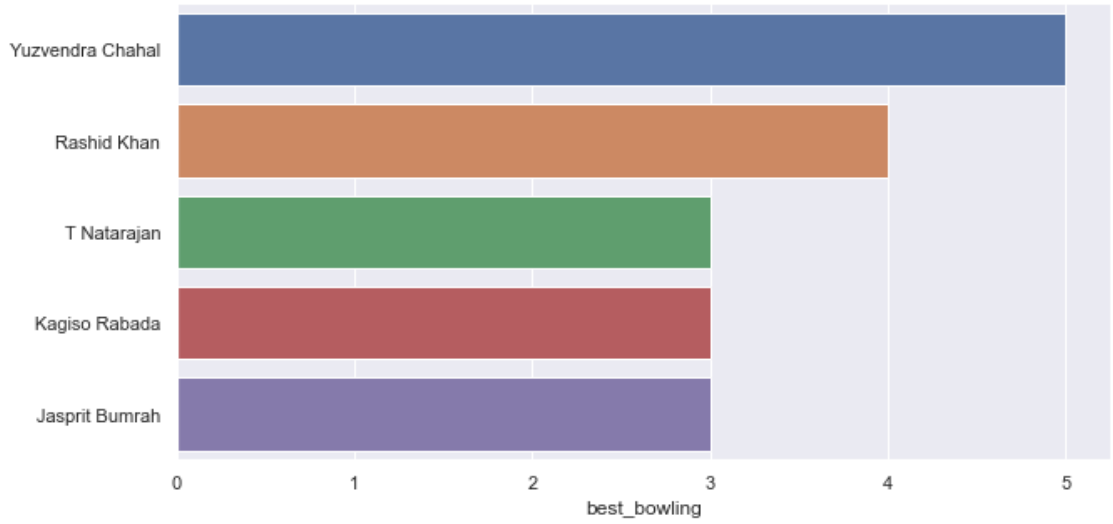


[227]:
```
top5_bowlers=ipl_data['best_bowling'].value_counts().nlargest(5)
top5_bowlers
```

[227]:
```
Yuzvendra Chahal    5
Rashid Khan         4
T Natarajan         3
Kagiso Rabada       3
Jasprit Bumrah      3
Name: best_bowling, dtype: int64
```

[228]:
```
sns.barplot(x=top5_bowlers,y=top5_bowlers.index)
# As per below Yuzevendra chahal was the best bowler
```

[228]:
```
<AxesSubplot:xlabel='best_bowling'>
```

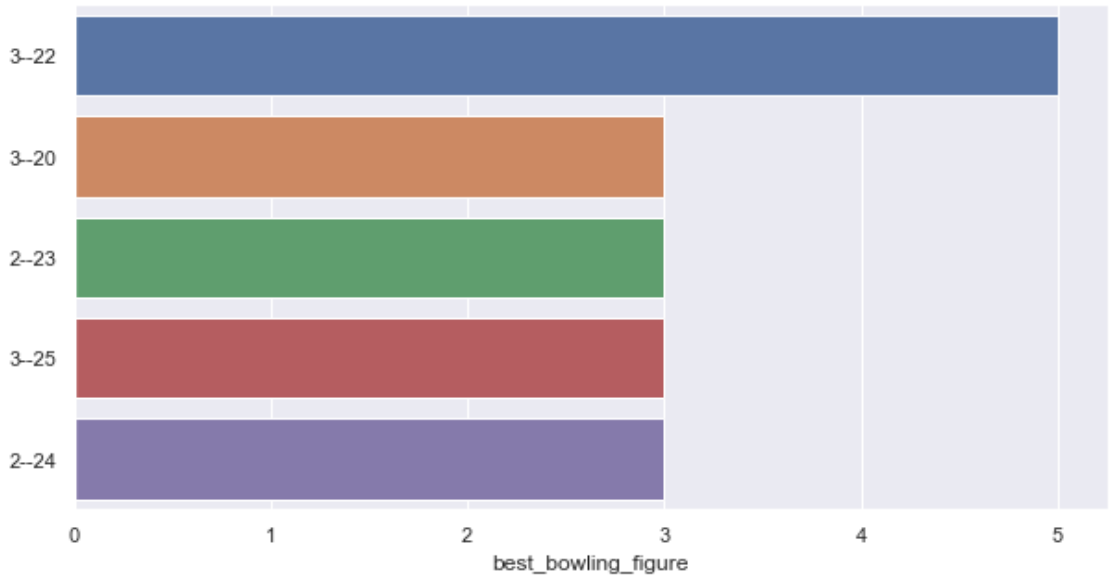


[229]:
```
Top5_bowling_figure=ipl_data['best_bowling_figure'].value_counts().nlargest(5)
Top5_bowling_figure
```

[229]:
```
3--22    5
3--20    3
2--23    3
3--25    3
2--24    3
Name: best_bowling_figure, dtype: int64
```

[230]:
```
sns.barplot(x=Top5_bowling_figure,y=Top5_bowling_figure.index)
# As per the below plot 3-22 is the most bowling figure
```

[230]:
```
<AxesSubplot:xlabel='best_bowling_figure'>
```


3--22
3--20
2--23
3--25
2--24
0
1
2
3
4
5
best_bowling_figure

[ ]: