SRM Institute of Science and Technology
College of Engineering and Technology
Department of Electronics and Communication Engineering

MINI PROJECT REPORT
ODD Semester, 2023-24

Subject Code & Name	:	18ECE372J – Python for Data Sciences
Year & Semester	:	III Year 5th Semester
Mini Project Title	:	Formula 1 Race Analytics: Visualisation for Seasons 1950-2022
Course In-charge	:	Dr S. Krithiga
Registration Number	:	RA2111053010021
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Formula 1 Race Analytics:
Visualisation for Seasons 1950-2022

OBJECTIVE:

The project's main objective is to make Formula 1 race data more accessible and engaging for fans, researchers, and enthusiasts, enabling them to explore historical race results, analyse driver performance, and gain insights into the sport's speed dynamics on different tracks over the years.

ABSTRACT:

Formula 1, or F1, is a motorsport defined by open wheeled single seated race cars. It features the best drivers in the most powerful and technically advanced cars. The sport is governed by the FIA (Fédération Internationale de l'Automobile). Here, 10 teams comprising of 2 drivers each compete in a series of races over a period of 1 year to find the ultimate driver and constructor champion.

This Formula 1 Python Program is a versatile tool for Formula 1 enthusiasts and researchers. It provides an interactive interface for exploring and analysing Formula 1 race data from 1950 to 2022. Powered by Python libraries such as NumPy, Pandas, Matplotlib, and Seaborn, this program offers multiple functionalities.

Users can interact with the program to achieve several objectives:

1. Retrieve Detailed Race Results: By specifying the year and the name of a Grand Prix event, users can access comprehensive race results, including driver and constructor information, grid positions, finishing positions, points earned, lap times, and more. This feature offers a deep dive into the details of any Formula 1 race within the specified time frame.
2. Explore All-Time Grand Prix Winners: The program showcases all Formula 1 Grand Prix winners, presenting a visual representation of the most successful drivers in the history of the sport. Users can gain insights into the legends who have conquered the most races.
3. Analyse Top 'n' Grand Prix Winners: Users can select a number 'n' to view a bar chart highlighting the top 'n' drivers with the most Grand Prix wins. This feature allows users to focus on the most dominant drivers in Formula 1 history.
4. Visualize Speed Dynamics Over the Years: The program provides a captivating visualization of average fastest lap speeds recorded on various tracks from the year 2004 onwards. This facetgrid plot offers a comparative view of speed dynamics at different Grand Prix events, adding an extra layer of understanding to the sport's evolution.
5. List all the winners of a particular year: Users can enter a year and we can show a list of all the winners for that particular year.
6. List the last 20 wins of a driver: Users can enter the name of a driver and we can show a list of the last 20 wins for the particular driver.

The primary objective of this mini project is to make Formula 1 race data accessible and engaging for fans and researchers alike. Whether users seek historical race results, wish to analyse driver performance, or are interested in the speed dynamics on Formula 1 tracks over the years, this program delivers an interactive and informative experience, offering a deeper appreciation of the world of Formula 1 racing.

SOFTWARE REQUIREMENTS:

Jupyter Note book

PYTHON CODE:

```
# Import all packages and set plots to be used
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline

#Loading the data
results = pd.read_csv(r"D:\F1 Data\results.csv")
races = pd.read_csv(r"D:\F1 Data\races.csv")
drivers = pd.read_csv(r"D:\F1 Data\drivers.csv")
constructors = pd.read_csv(r"D:\F1 Data\constructors.csv")

#Merge Datasets
f1 = pd.merge(results,
races[['raceId','year','name','round']],on='raceId',how='left')
f1=pd.merge(f1,drivers[['driverId','driverRef','nationality']],on='driverId',
how='left')
f1=pd.merge(f1,constructors[['constructorId','name','nationality']],
on='constructorId',how='left')

#Drop columns which are not required
f1.drop(['number', 'position', 'positionText', 'laps', 'fastestLap',
'statusId','resultId', 'raceId', 'driverId', 'constructorId'], axis=1, inplace=True)

#Rename columns
f1.rename(columns={'rank':'fastestLapRank', 'name_x':'gp_name',
            'nationality_x':'driver_nationality', 'name_y':'constructor_name',
            'nationality_y':'constructor_nationality', 'driverRef':'driver'},
            inplace=True)

#Re-Arrange Columns
f1 = f1[['year', 'gp_name', 'round','driver', 'constructor_name', 'grid',
      'positionOrder', 'points', 'time','milliseconds', 'fastestLapRank',
      'fastestLapTime', 'fastestLapSpeed', 'driver_nationality',
      'constructor_nationality']]

#Since the 2023 season is not yet complete, we will drop the 2023 season data.
f1 = f1[f1['year']!=2023]

#Sort Values in descending order of year
f1 = f1.sort_values(by=['year','round','positionOrder'],
ascending=[False,True,True])

#Replacing /N in columns since those readings are not there if driver did not finish
a race
#Also replacing /N in since no time records when the driver is lapped
f1.time.replace('\\N', np.nan, inplace=True)
f1.milliseconds.replace('\\N', np.nan, inplace=True)
f1.fastestLapRank.replace('\\N', np.nan, inplace=True)
f1.fastestLapTime.replace('\\N', np.nan, inplace=True)
f1.fastestLapSpeed.replace('\\N', np.nan, inplace=True)

#Changing Datatypes
f1.fastestLapSpeed = f1.fastestLapSpeed.astype(float)
f1.fastestLapRank = f1.fastestLapRank.astype(float)
f1.milliseconds = f1.milliseconds.astype(float)
```

```
#Reset Indices
f1.reset_index(drop=True, inplace=True)

#User-defined functions to perform operations
def All_GP_Winners ():
    driver_winner =f1.loc[f1['positionOrder']==1].groupby('driver')['positionOrder']
                  .count().sort_values(ascending=False).to_frame().reset_index()
    sns.barplot(data=driver_winner, y='driver', x='positionOrder', color='gold',
                                                                        alpha=1)
    plt.title('GP Winners in F1 as of 2022')
    plt.ylabel('Driver Name')
    plt.xlabel('Number of GP wins')
    plt.yticks([])

def Top_n_Winners(n):
    #Create new Data Frame for top 10 GP winnners
    driver_winner =f1.loc[f1['positionOrder']==1].groupby('driver')['positionOrder']
                  .count().sort_values(ascending=False).to_frame().reset_index()
    top10 = driver_winner.head(n)
    sns.barplot(data=top10, y='driver', x='positionOrder', color='Red',
                                                linewidth=0.8,edgecolor='black')
    plt.title(f'Top {n} GP winners')
    plt.xlabel('Number of Wins')
    plt.ylabel('Driver Name')

def Speed_History():
    #Visualisation of Speed on different tracks from 2004 onwards
    f1_speed = f1[f1['year']>=2004]
    f1_group_speed=f1_speed.groupby(['gp_name','year'])['fastestLapSpeed'].mean()
                                                        .to_frame().reset_index()
    #Creating a facetgrid
    g = sns.FacetGrid(data=f1_group_speed, col='gp_name', col_wrap=5)
    g.map(plt.scatter,'year', 'fastestLapSpeed', color='blue', alpha=0.5,
                                        linewidth=0.5, edgecolor='black', s=75)
    g.set_titles('{col_name}')
    g.set_xlabels('{Year}')
    g.set_ylabels('Average fastest speed(kmh)')
    plt.subplots_adjust(top=0.92)
    g.fig.suptitle('Average Speed amongst all teams during the fastest lap at
                                                                individual GPs');

def Requested_Race():
    Y=int(input('Enter Year: '))
    GP=input('Enter Grand Prix as "__________ Grand Prix": ')
    f1_req = f1[(f1['year'] == Y) & (f1['gp_name'] == GP)].reset_index()
    print('\n', f1_req)

def Year_Winners():
    Y=int(input('Enter Year: '))
    f1_req = f1[(f1['year'] == Y) & (f1['positionOrder'] == 1)].reset_index()
    print('\n',f1_req)

def Driver_Wins():
    D=input('Enter driver: ')
    f1_req = f1[(f1['driver'] == D) & (f1['positionOrder'] == 1)].copy()
    print(df_empty.head(20))
```

```
#Main Interface
print('Welcome! \nThis program is created to cater to the basic needs of all
                                                                    Formula 1 fans.')
print('Made by Angad Singh Hoonjan\nRA2111053010021')
flag = True
while(flag):
    print('\nChoose from the list below what you want to do: ')
    print('1. Results of a specific race')
    print('2. Visualisation of all Grand Prix winners ever')
    print("3. Top 'n' Grand Prix winnners")
    print('4. Visualisation of speed on different tracks over the years')
    print('5. List all winnners of a particular year')
    print('6. List the last 20 wins of a driver')
    print('7. Quit')
    choice = int(input('Enter your choice: '))
    if(choice==1):
        Requested_Race()
        flag=False
    elif(choice==2):
        All_GP_Winners()
        flag=False
    elif(choice==3):
        x=int(input('Enter the number of top drivers you want to see: '))
        Top_n_Winners(x)
        flag=False
    elif(choice==4):
        Speed_History()
        flag=False
    elif(choice==5):
        Year_Winners()
        flag=False
    elif(choice==6):
        Driver_Wins()
        flag=False
    elif(choice==7):
        flag=False
    else:
        print('You can only enter numbers from 1 to 5')
```

OUTPUT:

Final data frame after renaming and removing columns:

	year	gp_name	round	driver	constructor_name	grid	positionOrder	points	time	milliseconds	fastestLapRank	fastestLapTime	fastestLapSpeed	driver_nationality	constructor_nationality
0	2022	Bahrain Grand Prix	1	leclerc	Ferrari	1	1	26.0	1:37:33.584	5853584.0	1.0	1:34.570	206.018	Monegasque	Italian
1	2022	Bahrain Grand Prix	1	sainz	Ferrari	3	2	18.0	+5.598	5859182.0	3.0	1:35.740	203.501	Spanish	Italian
2	2022	Bahrain Grand Prix	1	hamilton	Mercedes	5	3	15.0	+9.675	5863259.0	5.0	1:36.228	202.469	British	German
3	2022	Bahrain Grand Prix	1	russell	Mercedes	9	4	12.0	+11.211	5864795.0	6.0	1:36.302	202.313	British	German
4	2022	Bahrain Grand Prix	1	kevin_magnussen	Haas F1 Team	7	5	10.0	+14.754	5868338.0	8.0	1:36.623	201.641	Danish	American
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25835	1950	Italian Grand Prix	7	sanesi	Alfa Romeo	4	23	0.0	NaN	NaN	NaN	NaN	NaN	Italian	Swiss
25836	1950	Italian Grand Prix	7	manzon	Simca	10	24	0.0	NaN	NaN	NaN	NaN	NaN	French	French
25837	1950	Italian Grand Prix	7	bira	Maserati	15	25	0.0	NaN	NaN	NaN	NaN	NaN	Thai	Italian
25838	1950	Italian Grand Prix	7	pietsch	Maserati	27	26	0.0	NaN	NaN	NaN	NaN	NaN	German	Italian
25839	1950	Italian Grand Prix	7	bonetto	Milano	23	27	0.0	NaN	NaN	NaN	NaN	NaN	Italian	Italian

1. Results of a specific race

```
Welcome!
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RA2111053010021

Choose from the list below what you want to do:
1. Results of a specific race
2. Visualisation of all Grand Prix winners ever
3. Top 'n' Grand Prix winnners
4. Visualisation of speed on different tracks over the years
5. List all winnners of a particular year
6. List the last 20 wins of a driver
7. Quit
Enter your choice: 1
Enter Year: 2022
Enter Grand Prix as "_____ Grand Prix": Abu Dhabi Grand Prix

     index  year              gp_name  round           driver  \
0      420  2022  Abu Dhabi Grand Prix     22   max_verstappen
1      421  2022  Abu Dhabi Grand Prix     22          leclerc
2      422  2022  Abu Dhabi Grand Prix     22            perez
3      423  2022  Abu Dhabi Grand Prix     22            sainz
4      424  2022  Abu Dhabi Grand Prix     22          russell
5      425  2022  Abu Dhabi Grand Prix     22           norris
6      426  2022  Abu Dhabi Grand Prix     22            ocon
7      427  2022  Abu Dhabi Grand Prix     22           stroll
8      428  2022  Abu Dhabi Grand Prix     22        ricciardo
9      429  2022  Abu Dhabi Grand Prix     22           vettel
10     430  2022  Abu Dhabi Grand Prix     22          tsunoda
11     431  2022  Abu Dhabi Grand Prix     22             zhou
12     432  2022  Abu Dhabi Grand Prix     22            albon
13     433  2022  Abu Dhabi Grand Prix     22            gasly
14     434  2022  Abu Dhabi Grand Prix     22           bottas
15     435  2022  Abu Dhabi Grand Prix     22  mick_schumacher
16     436  2022  Abu Dhabi Grand Prix     22  kevin_magnussen
17     437  2022  Abu Dhabi Grand Prix     22         hamilton
18     438  2022  Abu Dhabi Grand Prix     22           latifi
19     439  2022  Abu Dhabi Grand Prix     22           alonso
```

	constructor_name	grid	positionOrder	points	time	milliseconds	\
0	Red Bull	1	1	25.0	1:27:45.914	5265914.0	
1	Ferrari	3	2	18.0	+8.771	5274685.0	
2	Red Bull	2	3	15.0	+10.093	5276007.0	
3	Ferrari	4	4	12.0	+24.892	5290806.0	
4	Mercedes	6	5	10.0	+35.888	5301802.0	
5	McLaren	7	6	9.0	+56.234	5322148.0	
6	Alpine F1 Team	8	7	6.0	+57.240	5323154.0	
7	Aston Martin	14	8	4.0	+1:16.931	5342845.0	
8	McLaren	13	9	2.0	+1:23.268	5349182.0	
9	Aston Martin	9	10	1.0	+1:23.898	5349812.0	
10	AlphaTauri	11	11	0.0	+1:29.371	5355285.0	
11	Alfa Romeo	15	12	0.0	NaN	NaN	
12	Williams	19	13	0.0	NaN	NaN	
13	AlphaTauri	17	14	0.0	NaN	NaN	
14	Alfa Romeo	18	15	0.0	NaN	NaN	
15	Haas F1 Team	12	16	0.0	NaN	NaN	
16	Haas F1 Team	16	17	0.0	NaN	NaN	
17	Mercedes	5	18	0.0	NaN	NaN	
18	Williams	20	19	0.0	NaN	NaN	
19	Alpine F1 Team	10	20	0.0	NaN	NaN	

	fastestLapRank	fastestLapTime	fastestLapSpeed	driver_nationality	\
0	6.0	1:29.392	212.676	Dutch	
1	10.0	1:29.719	211.901	Monegasque	
2	4.0	1:28.972	213.680	Mexican	
3	3.0	1:28.879	213.904	Spanish	
4	2.0	1:28.836	214.007	British	
5	1.0	1:28.391	215.085	British	
6	5.0	1:29.333	212.817	French	
7	9.0	1:29.620	212.135	Canadian	
8	18.0	1:30.785	209.413	Australian	
9	15.0	1:30.312	210.510	German	
10	7.0	1:29.489	212.446	Japanese	
11	8.0	1:29.600	212.183	Chinese	
12	13.0	1:29.939	211.383	Thai	
13	19.0	1:31.081	208.732	French	
14	16.0	1:30.352	210.417	Finnish	
15	12.0	1:29.833	211.632	German	
16	20.0	1:31.158	208.556	Danish	
17	11.0	1:29.788	211.738	British	
18	14.0	1:30.309	210.517	Canadian	
19	17.0	1:30.579	209.889	Spanish	

	constructor_nationality
0	Austrian
1	Italian
2	Austrian
3	Italian
4	German
5	British
6	French
7	British
8	British
9	British
10	Italian
11	Swiss
12	British
13	Italian
14	Swiss
15	American
16	American
17	German
18	British
19	French

2. Visualisation of all Grand Prix winners ever

```
Welcome!
This program is created to cater to the basic needs of all Formula 1 fans.
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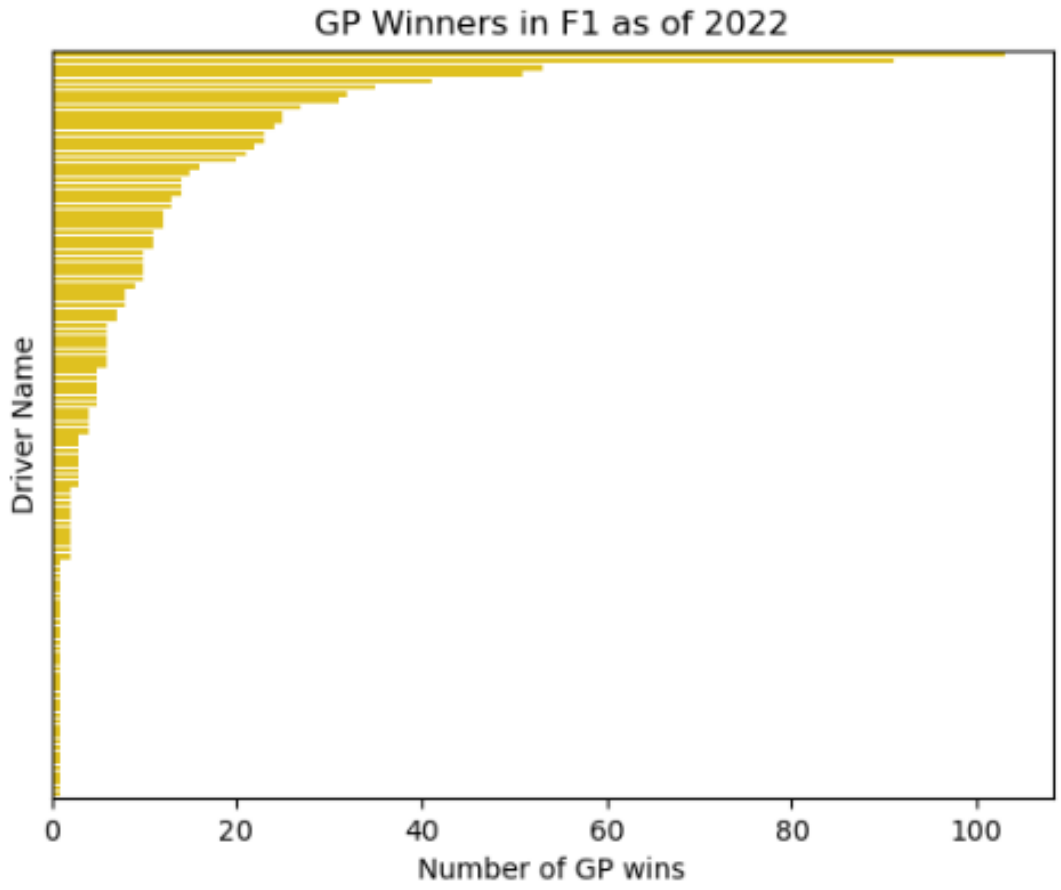
RA2111053010021

Choose from the list below what you want to do:
1. Results of a specific race
2. Visualisation of all Grand Prix winners ever
3. Top 'n' Grand Prix winnners
4. Visualisation of speed on different tracks over the years
5. List all winnners of a particular year
6. List the last 20 wins of a driver
7. Quit
Enter your choice: 2
```



3. Top ‘n’ Grand Prix winners

```
Welcome!
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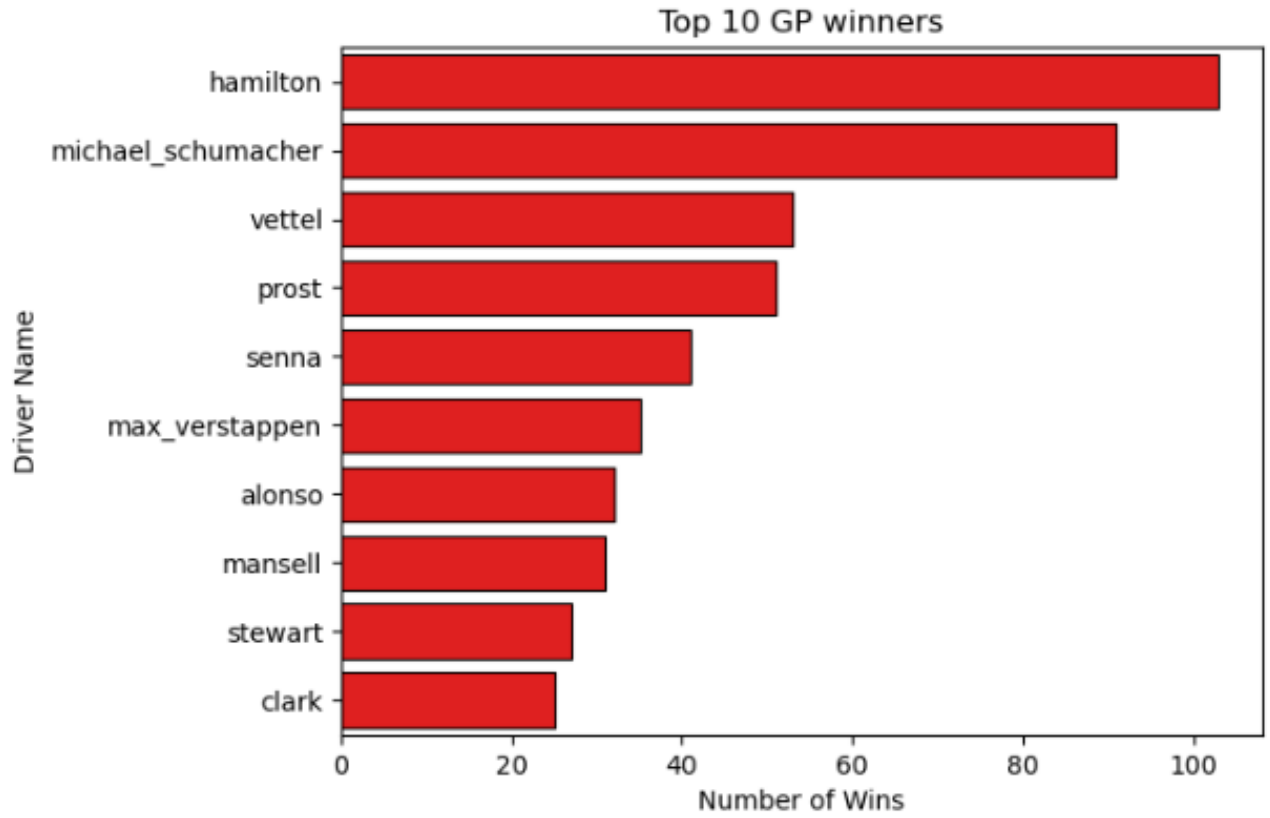
RA2111053010021

Choose from the list below what you want to do:
1. Results of a specific race
2. Visualisation of all Grand Prix winners ever
3. Top 'n' Grand Prix winnners
4. Visualisation of speed on different tracks over the years
5. List all winnners of a particular year
6. List the last 20 wins of a driver
7. Quit
Enter your choice: 3
Enter the number of top drivers you want to see: 10
```



4. Visualisation of speed on different tracks over the years

```
Welcome!
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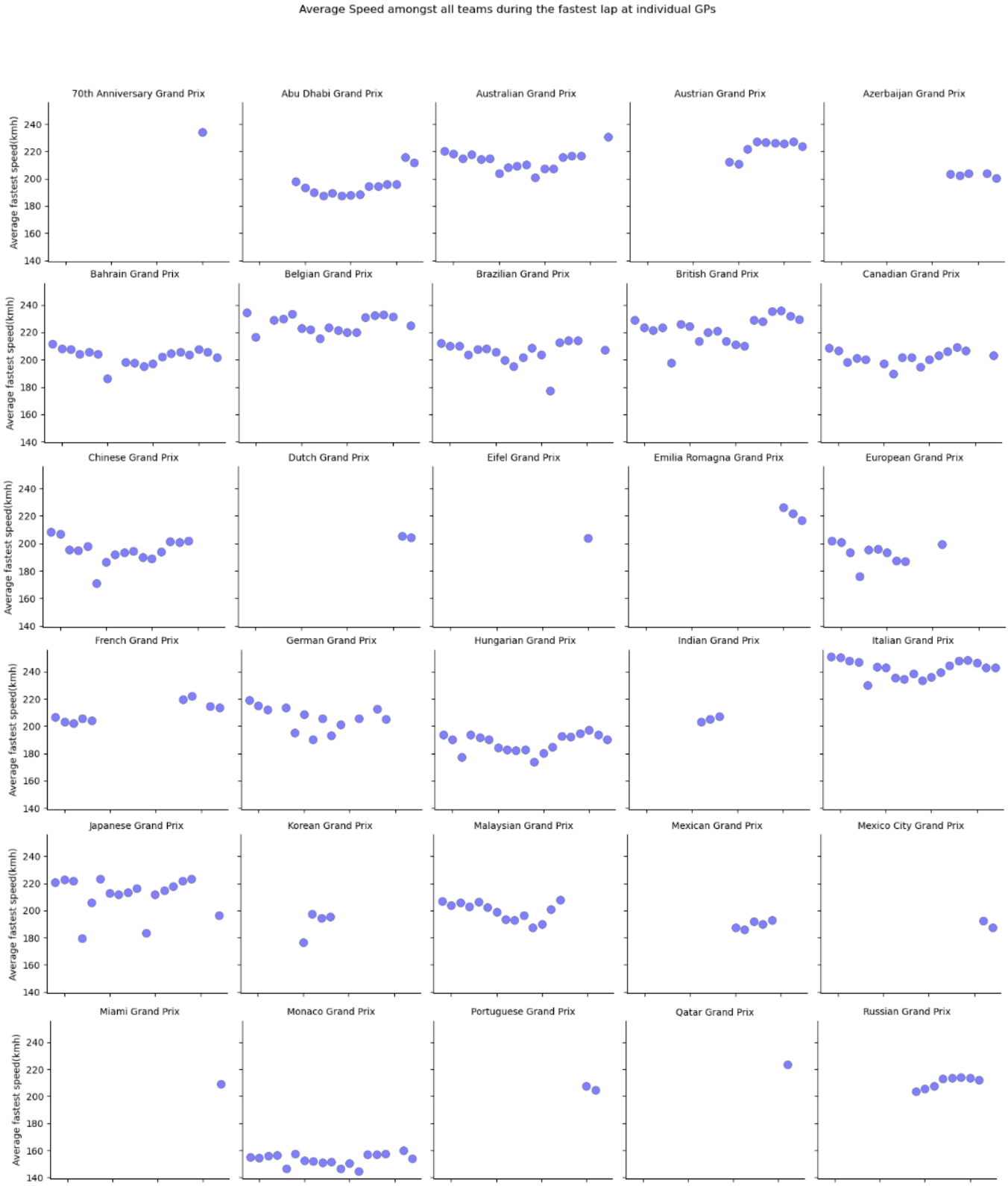
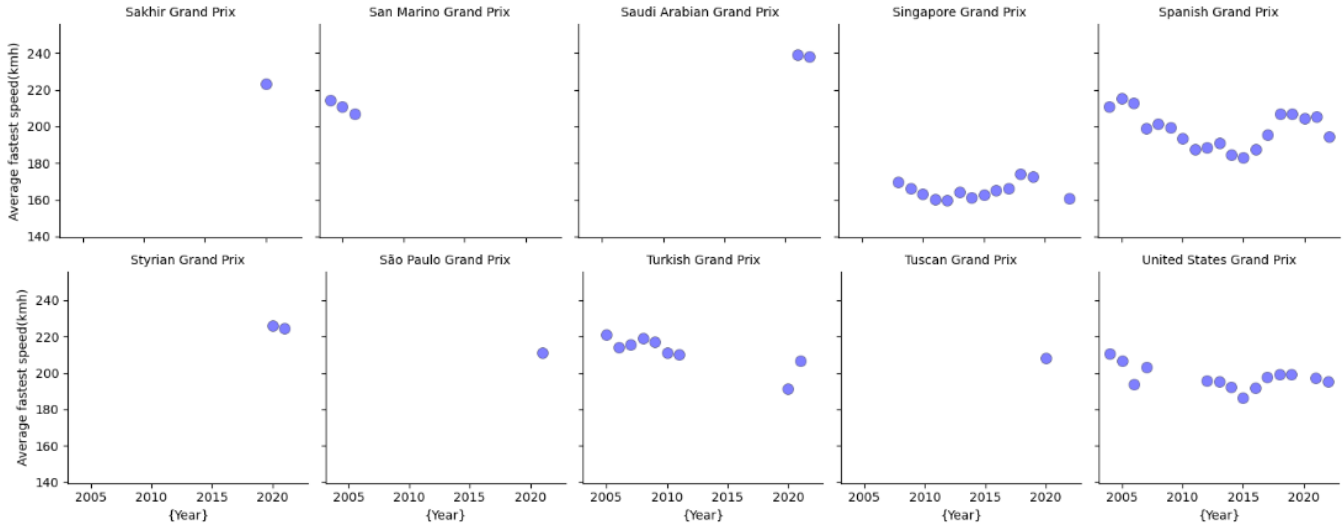
RA2111053010021

Choose from the list below what you want to do:
1. Results of a specific race
2. Visualisation of all Grand Prix winners ever
3. Top 'n' Grand Prix winnners
4. Visualisation of speed on different tracks over the years
5. List all winnners of a particular year
6. List the last 20 wins of a driver
7. Quit
Enter your choice: 4
```





5. List all the winners of a particular year

```
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Choose from the list below what you want to do:
1. Results of a specific race
2. Visualisation of all Grand Prix winners ever
3. Top 'n' Grand Prix winnners
4. Visualisation of speed on different tracks over the years
5. List all winnners of a particular year
6. List the last 20 wins of a driver
7. Quit
Enter your choice: 5
Enter Year: 2021
```

	index	year	gp_name	round	driver	\
0	440	2021	Bahrain Grand Prix	1	hamilton	
1	460	2021	Emilia Romagna Grand Prix	2	max_verstappen	
2	480	2021	Portuguese Grand Prix	3	hamilton	
3	500	2021	Spanish Grand Prix	4	hamilton	
4	520	2021	Monaco Grand Prix	5	max_verstappen	
5	540	2021	Azerbaijan Grand Prix	6	perez	
6	560	2021	French Grand Prix	7	max_verstappen	
7	580	2021	Styrian Grand Prix	8	max_verstappen	
8	600	2021	Austrian Grand Prix	9	max_verstappen	
9	620	2021	British Grand Prix	10	hamilton	
10	640	2021	Hungarian Grand Prix	11	ocon	
11	660	2021	Belgian Grand Prix	12	max_verstappen	
12	680	2021	Dutch Grand Prix	13	max_verstappen	
13	700	2021	Italian Grand Prix	14	ricciardo	
14	720	2021	Russian Grand Prix	15	hamilton	
15	740	2021	Turkish Grand Prix	16	bottas	
16	760	2021	United States Grand Prix	17	max_verstappen	
17	780	2021	Mexico City Grand Prix	18	max_verstappen	
18	800	2021	São Paulo Grand Prix	19	hamilton	
19	820	2021	Qatar Grand Prix	20	hamilton	
20	840	2021	Saudi Arabian Grand Prix	21	hamilton	
21	860	2021	Abu Dhabi Grand Prix	22	max_verstappen	

	constructor_name	grid	positionOrder	points	time	milliseconds	\
0	Mercedes	2	1	25.0	1:32:03.897	5523897.0	
1	Red Bull	3	1	25.0	2:02:34.598	7354598.0	
2	Mercedes	2	1	25.0	1:34:31.421	5671421.0	
3	Mercedes	1	1	25.0	1:33:07.680	5587680.0	
4	Red Bull	2	1	25.0	1:38:56.820	5936820.0	
5	Red Bull	6	1	25.0	2:13:36.410	8016410.0	
6	Red Bull	1	1	26.0	1:27:25.770	5245770.0	
7	Red Bull	1	1	25.0	1:22:18.925	4938925.0	
8	Red Bull	1	1	26.0	1:23:54.543	5034543.0	
9	Mercedes	2	1	25.0	1:58:23.284	7103284.0	
10	Alpine F1 Team	8	1	25.0	2:04:43.199	7483199.0	
11	Red Bull	1	1	12.5	3:27.071	207071.0	
12	Red Bull	1	1	25.0	1:30:05.395	5405395.0	
13	McLaren	2	1	26.0	1:21:54.365	4914365.0	
14	Mercedes	4	1	25.0	1:30:41.001	5441001.0	
15	Mercedes	1	1	26.0	1:31:04.103	5464103.0	
16	Red Bull	1	1	25.0	1:34:36.552	5676552.0	
17	Red Bull	3	1	25.0	1:38:39.086	5919086.0	
18	Mercedes	10	1	25.0	1:32:22.851	5542851.0	
19	Mercedes	1	1	25.0	1:24:28.471	5068471.0	
20	Mercedes	1	1	26.0	2:06:15.118	7575118.0	
21	Red Bull	1	1	26.0	1:30:17.345	5417345.0	

	fastestLapRank	fastestLapTime	fastestLapSpeed	driver_nationality	\
0	4.0	1:34.015	207.235	British	
1	2.0	1:17.524	227.960	Dutch	
2	4.0	1:20.933	206.971	British	
3	5.0	1:20.665	208.640	British	
4	6.0	1:14.649	160.929	Dutch	
5	2.0	1:44.687	206.432	Mexican	
6	1.0	1:36.404	218.156	Dutch	
7	3.0	1:08.017	228.542	Dutch	
8	1.0	1:06.200	234.815	Dutch	
9	2.0	1:29.699	236.430	British	
10	5.0	1:21.421	193.704	French	
11	0.0	NaN	NaN	Dutch	
12	3.0	1:13.275	209.244	Dutch	
13	1.0	1:24.812	245.894	Australian	
14	2.0	1:37.575	215.760	British	
15	1.0	1:30.432	212.500	Finnish	
16	2.0	1:39.096	200.278	Dutch	
17	2.0	1:18.999	196.134	Dutch	
18	2.0	1:11.982	215.503	British	
19	2.0	1:25.084	227.633	British	
20	1.0	1:30.734	244.962	British	
21	1.0	1:26.103	220.800	Dutch	

	constructor_nationality
0	German
1	Austrian
2	German
3	German
4	Austrian
5	Austrian
6	Austrian
7	Austrian
8	Austrian
9	German
10	French
11	Austrian
12	Austrian
13	British
14	German
15	German
16	Austrian
17	Austrian
18	German
19	German
20	German
21	Austrian

6. List of the last 20 wins of a driver

```
Welcome!
This program is created to cater to the basic needs of all Formula 1 fans.
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Choose from the list below what you want to do:
1. Results of a specific race
2. Visualisation of all Grand Prix winners ever
3. Top 'n' Grand Prix winnners
4. Visualisation of speed on different tracks over the years
5. List all winnners of a particular year
6. List the last 20 wins of a driver
7. Quit
Enter your choice: 6
Enter driver: max_verstappen
    index  year                    gp_name  round          driver  \
0      20  2022   Saudi Arabian Grand Prix      2  max_verstappen
1      60  2022  Emilia Romagna Grand Prix      4  max_verstappen
2      80  2022           Miami Grand Prix      5  max_verstappen
3     100  2022         Spanish Grand Prix      6  max_verstappen
4     140  2022      Azerbaijan Grand Prix      8  max_verstappen
5     160  2022        Canadian Grand Prix      9  max_verstappen
6     220  2022          French Grand Prix     12  max_verstappen
7     240  2022       Hungarian Grand Prix     13  max_verstappen
8     260  2022         Belgian Grand Prix     14  max_verstappen
9     280  2022           Dutch Grand Prix     15  max_verstappen
10    300  2022         Italian Grand Prix     16  max_verstappen
11    340  2022        Japanese Grand Prix     18  max_verstappen
12    360  2022   United States Grand Prix     19  max_verstappen
13    380  2022     Mexico City Grand Prix     20  max_verstappen
14    420  2022       Abu Dhabi Grand Prix     22  max_verstappen
15    460  2021  Emilia Romagna Grand Prix      2  max_verstappen
16    520  2021         Monaco Grand Prix      5  max_verstappen
17    560  2021          French Grand Prix      7  max_verstappen
18    580  2021         Styrian Grand Prix      8  max_verstappen
19    600  2021        Austrian Grand Prix      9  max_verstappen
   constructor_name  grid  positionOrder  points         time  milliseconds  \
0          Red Bull     4              1    25.0  1:24:19.293     5059293.0
1          Red Bull     1              1    26.0  1:32:07.986     5527986.0
2          Red Bull     3              1    26.0  1:34:24.258     5664258.0
3          Red Bull     2              1    25.0  1:37:20.475     5840475.0
4          Red Bull     3              1    25.0  1:34:05.941     5645941.0
5          Red Bull     1              1    25.0  1:36:21.757     5781757.0
6          Red Bull     2              1    25.0  1:30:02.112     5402112.0
7          Red Bull    10              1    25.0  1:39:35.912     5975912.0
8          Red Bull    14              1    26.0  1:25:52.894     5152894.0
9          Red Bull     1              1    26.0  1:36:42.773     5802773.0
10         Red Bull     7              1    25.0  1:20:27.511     4827511.0
11         Red Bull     1              1    25.0  3:01:44.004    10904004.0
12         Red Bull     2              1    25.0  1:42:11.687     6131687.0
13         Red Bull     1              1    25.0  1:38:36.729     5916729.0
14         Red Bull     1              1    25.0  1:27:45.914     5265914.0
15         Red Bull     3              1    25.0  2:02:34.598     7354598.0
16         Red Bull     2              1    25.0  1:38:56.820     5936820.0
17         Red Bull     1              1    26.0  1:27:25.770     5245770.0
18         Red Bull     1              1    25.0  1:22:18.925     4938925.0
19         Red Bull     1              1    26.0  1:23:54.543     5034543.0
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	fastestLapRank	fastestLapTime	fastestLapSpeed	driver_nationality	constructor_nationality
0	2.0	1:31.772	242.191	Dutch	Austrian
1	1.0	1:18.446	225.281	Dutch	Austrian
2	1.0	1:31.361	213.255	Dutch	Austrian
3	4.0	1:25.456	196.943	Dutch	Austrian
4	2.0	1:46.050	203.779	Dutch	Austrian
5	2.0	1:15.839	207.012	Dutch	Austrian
6	2.0	1:37.491	215.724	Dutch	Austrian
7	6.0	1:22.126	192.041	Dutch	Austrian
8	1.0	1:49.354	230.575	Dutch	Austrian
9	1.0	1:13.652	208.173	Dutch	Austrian
10	6.0	1:24.745	246.088	Dutch	Austrian
11	4.0	1:44.911	199.266	Dutch	Austrian
12	2.0	1:39.541	199.383	Dutch	Austrian
13	4.0	1:22.046	188.850	Dutch	Austrian
14	6.0	1:29.392	212.676	Dutch	Austrian
15	2.0	1:17.524	227.960	Dutch	Austrian
16	6.0	1:14.649	160.929	Dutch	Austrian
17	1.0	1:36.404	218.156	Dutch	Austrian
18	3.0	1:08.017	228.542	Dutch	Austrian
19	1.0	1:06.200	234.815	Dutch	Austrian

CONCLUSION:

The Formula 1 Python Program is a successful and engaging mini project that provides Formula 1 fans and researchers with a valuable tool for exploring and analyzing Formula 1 race data. This project demonstrates the power and versatility of Python in handling and presenting complex datasets, enhancing our understanding of the sport.

Through this program, users can access a wide array of information about Formula 1 races from 1950 to 2022, ranging from race results and driver details to constructor statistics and lap times. This accessibility is invaluable for fans who want to relive historic races or researchers seeking comprehensive data for in-depth analysis.

The program's interactive features, such as visualizing all-time Grand Prix winners and analyzing top 'n' Grand Prix winners, add depth to the Formula 1 experience, enabling users to appreciate the achievements of legendary drivers over the years. The visualizations of average fastest lap speeds on different tracks provide a unique perspective on the sport's evolution.

In conclusion, this mini project successfully achieves its objectives of making Formula 1 race data accessible, engaging, and informative. It serves as a powerful tool for Formula 1 enthusiasts, offering a deeper understanding of the sport's history, the dominance of certain drivers, and the dynamics of speed on various tracks. It stands as an excellent example of how data analysis and visualization can enhance our appreciation of a beloved sport like Formula 1.

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