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

```
df = pd.read_csv('coaster_db.csv')
```

```
df.head()
```

coaster_name	Length	Speed	Location	Status	Opening date	Type	Manufacturer	res
Switchback Railway	600 ft (180 m)	6 mph (9.7 km/h)	Coney Island	Removed	June 16, 1884	Wood	LaMarcus Adna Thompson	
Flip Flap Railway	NaN	NaN	Sea Lion Park	Removed	1895	Wood	Lina Beecher	
Switchback Railway (Euclid Beach Park)	NaN	NaN	Cleveland, Ohio, United States	Closed	NaN	Other	NaN	
Loop the Loop (Coney Island)	NaN	NaN	Other	Removed	1901	Steel	Edwin Prescott	
Loop the Loop (Young's Pier)	NaN	NaN	Other	Removed	1901	Steel	Edwin Prescott	

ws × 56 columns

Step 1: Data Understanding

```
df.shape
```

```
(1087, 56)
```

```
df.columns
```

```
Index(['coaster_name', 'Length', 'Speed', 'Location', 'Status', 'Opening date',
       'Type', 'Manufacturer', 'Height restriction', 'Model', 'Height',
       'Inversions', 'Lift/launch system', 'Cost', 'Trains', 'Park section',
       'Duration', 'Capacity', 'G-force', 'Designer', 'Max vertical angle',
       'Drop', 'Soft opening date', 'Fast Lane available', 'Replaced',
       'Track layout', 'Fastrack available', 'Soft opening date.1',
       'Closing date', 'Opened', 'Replaced by', 'Website',
       'Flash Pass Available', 'Must transfer from wheelchair', 'Theme',
       'Single rider line available', 'Restraint Style',
       'Flash Pass available', 'Acceleration', 'Restraints', 'Name',
       'year_introduced', 'latitude', 'longitude', 'Type_Main',
       'opening_date_clean', 'speed1', 'speed2', 'speed1_value', 'speed1_unit',
       'speed_mph', 'height_value', 'height_unit', 'height_ft',
       'Inversions_clean', 'Gforce_clean'],
      dtype='object')
```

```
df.dtypes
#every column is a series, and every series has a type
```

```
coaster_name                      object
Length                            object
Speed                             object
Location                          object
Status                            object
Opening date                      object
Type                              object
Manufacturer                      object
Height restriction                object
Model                             object
Height                            object
Inversions                       float64
Lift/launch system                object
Cost                              object
Trains                            object
Park section                      object
Duration                          object
Capacity                          object
G-force                           object
Designer                          object
```

```
Max vertical angle                object
Drop                              object
Soft opening date                 object
Fast Lane available               object
Replaced                          object
Track layout                      object
Fastrack available                object
Soft opening date.1               object
Closing date                      object
Opened                            object
Replaced by                       object
Website                           object
Flash Pass Available              object
Must transfer from wheelchair     object
Theme                             object
Single rider line available       object
Restraint Style                   object
Flash Pass available              object
Acceleration                      object
Restraints                        object
Name                              object
year_introduced                    int64
latitude                         float64
longitude                        float64
Type_Main                         object
opening_date_clean                object
speed1                            object
speed2                            object
speed1_value                     float64
speed1_unit                       object
speed_mph                        float64
height_value                     float64
height_unit                       object
height_ft                        float64
Inversions_clean                   int64
Gforce_clean                     float64
dtype: object
```

```
df.describe()
```

	Inversions	year_introduced	latitude	longitude	speed1_value	speed_mph
count	932.000000	1087.000000	812.000000	812.000000	937.000000	937.000000
mean	1.547210	1994.986201	38.373484	-41.595373	53.850374	48.617289
std	2.114073	23.475248	15.516596	72.285227	23.385518	16.678031
min	0.000000	1884.000000	-48.261700	-123.035700	5.000000	5.000000
25%	0.000000	1989.000000	35.031050	-84.552200	40.000000	37.300000
50%	0.000000	2000.000000	40.289800	-76.653600	50.000000	49.700000
75%	3.000000	2010.000000	44.799600	2.778100	63.000000	58.000000
max	14.000000	2022.000000	63.230900	153.426500	240.000000	149.100000

Step 2: Data Preparation

1. Dropping irrelevant columns and rows
2. Identifying duplicated columns
3. Renaming columns
4. Feature creation

```
df.columns
```

```
Index(['coaster_name', 'Length', 'Speed', 'Location', 'Status', 'Opening date',
       'Type', 'Manufacturer', 'Height restriction', 'Model', 'Height',
       'Inversions', 'Lift/launch system', 'Cost', 'Trains', 'Park section',
       'Duration', 'Capacity', 'G-force', 'Designer', 'Max vertical angle',
       'Drop', 'Soft opening date', 'Fast Lane available', 'Replaced',
       'Track layout', 'Fastrack available', 'Soft opening date.1',
       'Closing date', 'Opened', 'Replaced by', 'Website',
       'Flash Pass Available', 'Must transfer from wheelchair', 'Theme',
       'Single rider line available', 'Restraint Style',
       'Flash Pass available', 'Acceleration', 'Restraints', 'Name',
       'year_introduced', 'latitude', 'longitude', 'Type_Main',
       'opening_date_clean', 'speed1', 'speed2', 'speed1_value', 'speed1_unit',
       'speed_mph', 'height_value', 'height_unit', 'height_ft',
       'Inversions_clean', 'Gforce_clean'],
      dtype='object')
```

```
#only show the data we need
df = df[['coaster_name',
     #'Length', 'Speed',
     'Location', 'Status',
     #'Opening date','Type',
     'Manufacturer',
     #'Height restriction', 'Model', 'Height',
     #'Inversions', 'Lift/launch system', 'Cost', 'Trains', 'Park section',
      # 'Duration', 'Capacity', 'G-force', 'Designer', 'Max vertical angle',
       #'Drop', 'Soft opening date', 'Fast Lane available', 'Replaced',
       #'Track layout', 'Fastrack available', 'Soft opening date.1',
       #'Closing date', 'Opened', 'Replaced by', 'Website',
       #'Flash Pass Available', 'Must transfer from wheelchair', 'Theme',
       #'Single rider line available', 'Restraint Style',
       #'Flash Pass available', 'Acceleration', 'Restraints', 'Name',
       'year_introduced', 'latitude', 'longitude', 'Type_Main',
       'opening_date_clean',
     #'speed1', 'speed2', 'speed1_value', 'speed1_unit',
       'speed_mph',
     #'height_value', 'height_unit',
     'height_ft',
       'Inversions_clean', 'Gforce_clean']].copy()

#or we can use df.drop()
#df.drop(['Opening Date'], axis=1)
```

```
df.shape
```

```
(1087, 13)
```

```
df.dtypes
#opening_date_clean supposed to be datetime type not object
```

```
coaster_name           object
Location               object
Status                 object
Manufacturer           object
year_introduced         int64
latitude              float64
longitude             float64
Type_Main              object
opening_date_clean     object
speed_mph             float64
height_ft             float64
Inversions_clean        int64
Gforce_clean          float64
dtype: object
```

Changing the data type

```
df['opening_date_clean']= pd.to_datetime(df['opening_date_clean'])
```

Rename Column

```
df = df.rename(columns={'coaster_name' : 'Coaster_Name',
                   'year_introduced' : 'Year_Open',
                   'latitude':'Latitude',
                   'longitude' : 'Longitude',
                   'opening_date_clean' : 'Opening_Date',
                   'speed_mph' : 'Speed_mph',
                   'height_ft' : 'Height_ft',
                   'Inversions_clean' : 'Inversions',
                   'Gforce_clean' : 'Gforce'})
```

```
df.head()
```

	Coaster_Name	Location	Status	Manufacturer	Year_Open	Latitude	Longitude	Ty
0	Switchback Railway	Coney Island	Removed	LaMarcus Adna Thompson	1884	40.5740	-73.9780	
1	Flip Flap Railway	Sea Lion Park	Removed	Lina Beecher	1895	40.5780	-73.9790	
2	Switchback Railway (Euclid Beach Park)	Cleveland, Ohio, United States	Closed	NaN	1896	41.5800	-81.5700	

Identify Missing Value

```
df.isnull().sum()
```

```
Coaster_Name      0
Location          0
Status          213
Manufacturer     59
Year_Open         0
Latitude        275
Longitude       275
Type_Main         0
Opening_Date    250
Speed_mph       150
Height_ft       916
Inversions        0
Gforce          725
dtype: int64
```

Identify Duplicate Rows

```
df.loc[df.duplicated()]
#there are no duplicate row in all column
```

Coaster_Name	Location	Status	Manufacturer	Year_Open	Latitude	Longitude	Type_I

```
df.duplicated(subset= ['Coaster_Name']).sum()
#Checking duplicate rows in each column
```

```
97
```

```
df.loc[df.duplicated(subset= ['Coaster_Name'])]
```

	Coaster_Name	Location	Status	Manufacturer	Year_Open	Latitude	Longitu
43	Crystal Beach Cyclone	Crystal Beach Park	Removed	Traver Engineering	1927	42.8617	-79.05
60	Derby Racer	Revere Beach	Removed	Fred W. Pearce	1937	42.4200	-70.98
61	Blue Streak (Conneaut Lake)	Conneaut Lake Park	Closed	NaN	1938	41.6349	-80.31
167	Big Thunder Mountain Railroad	Other	NaN	Arrow Development (California and Florida)Dyna...	1980	NaN	N
237	Thunder Run (Canada's Wonderland)	Canada's Wonderland	Operating	Mack Rides	1986	43.8427	-79.54
...	...	...	...	...	...	...	
1063	Lil' Devil Coaster	Six Flags Great Adventure	Operating	Zamperla	2021	40.1343	-74.44
1064	Little Dipper (Conneaut Lake Park)	Conneaut Lake Park	Operating	Allan Herschell Company	2021	41.6343	-80.31
1080	Iron Gwazi	Busch Gardens Tampa Bay	Under construction	Rocky Mountain Construction	2022	28.0339	-82.42

Checking Dupliacte

```
df.query('Coaster_Name == "Iron Gwazi"')
#there is a difference in the Year_Open data, it is hypothetically that
#the "Iron Gwazi" Coaster was closed in between 1999-2022 and re-open in 2022
```

	Coaster_Name	Location	Status	Manufacturer	Year_Open	Latitude	Longitud

Drop Duplicated Rows

Tampa construction Construction

```
df.duplicated(subset= ['Coaster_Name', 'Location', 'Opening_Date']).sum()
```

```
97
```

```
df = df.loc[~df.duplicated(subset= ['Coaster_Name', 'Location', 'Opening_Date'])]
#locate where the values not dupplicated of this subset of columns
```

```
#checking
df['Coaster_Name'].str.contains('Iron Gwazi').sum()
```

```
1
```

Reset the Index

```
df = df.loc[~df.duplicated(subset= ['Coaster_Name', 'Location', 'Opening_Date'])] \
.reset_index
#.reset_index(drop=True) to delete the previous index
```

```
df = df.drop(columns=['index'])
```

```
df.shape
```

```
(990, 13)
```

Step 3: Feature Understanding

(Univariate Analysis)

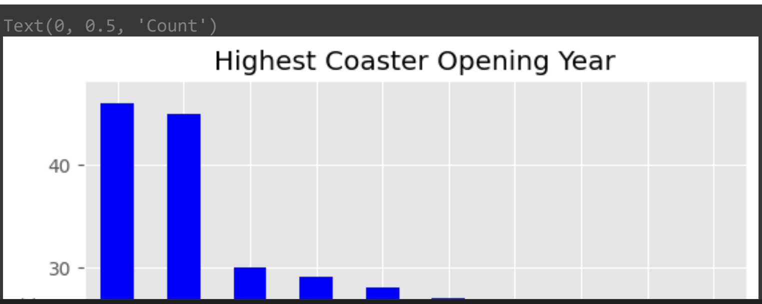
- Plotting Feature Distribution
  - Histogram
  - KDE
  - Boxplot

```
df.head()
```

	Coaster_Name	Location	Status	Manufacturer	Year_Open	Latitude	Longitude	Ty
0	Switchback Railway	Coney Island	Removed	LaMarcus Adna Thompson	1884	40.5740	-73.9780	
1	Flip Flap Railway	Sea Lion Park	Removed	Lina Beecher	1895	40.5780	-73.9790	
2	Switchback Railway (Euclid Beach Park)	Cleveland, Ohio, United States	Closed	NaN	1896	41.5800	-81.5700	

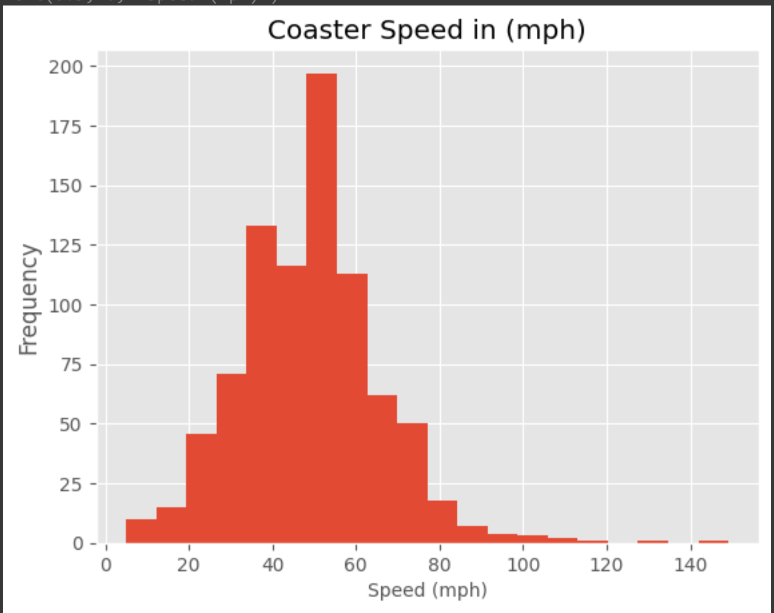
```
#To see Unique Values
ax = df['Year_Open'].value_counts().head(10).plot(kind='bar', color='blue', title='Highest Coaster Opening Year')
ax.set_xlabel('Year')
ax.set_ylabel('Count')
```

```
Text(0, 0.5, 'Count')
```



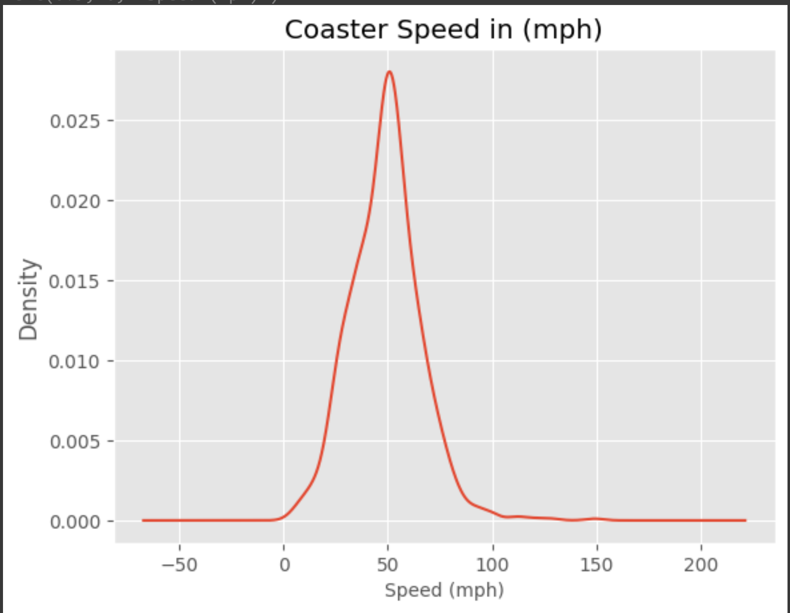
```python
ax = df['Speed_mph'].plot(kind='hist', bins=20, title='Coaster Speed in (mph)')
ax.set_xlabel('Speed (mph)', size=10)
```

```
Text(0.5, 0, 'Speed (mph)')
```



```python
ax = df['Speed_mph'].plot(kind='kde', title='Coaster Speed in (mph)')
ax.set_xlabel('Speed (mph)', size=10)
```

```
Text(0.5, 0, 'Speed (mph)')
```



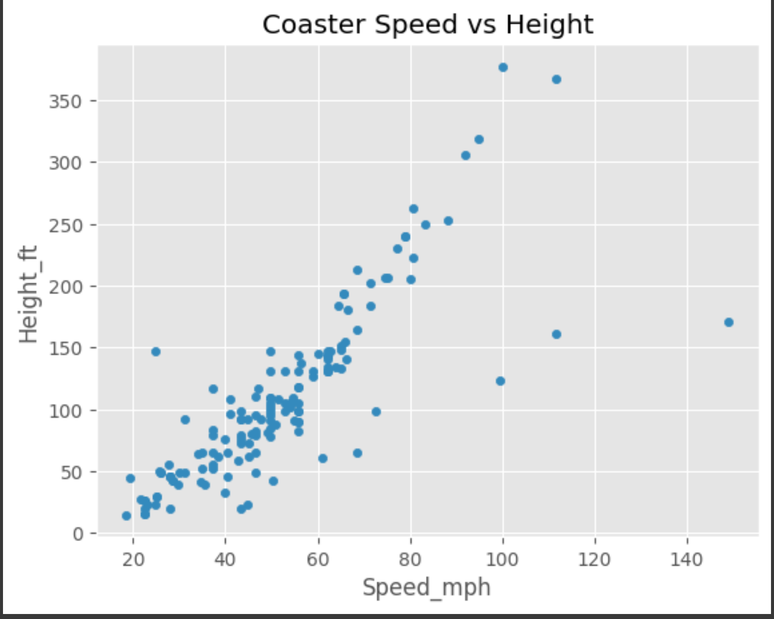
Step 4: Feature Relationships

- Scatterplot
- Heatmap Correlation
- Pairplot
- Groupby comparasions

```
df.head()
```

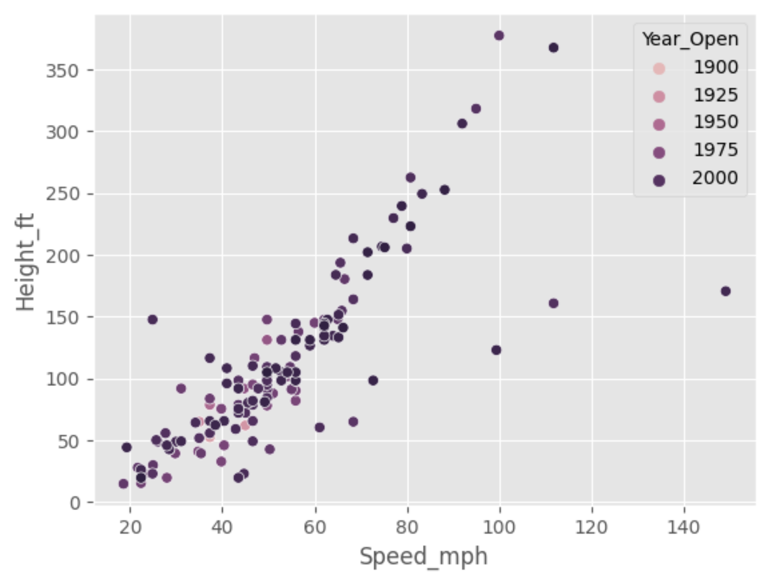
	Coaster_Name	Location	Status	Manufacturer	Year_Open	Latitude	Longitude	Ty
0	Switchback Railway	Coney Island	Removed	LaMarcus Adna Thompson	1884	40.5740	-73.9780	
1	Flip Flap Railway	Sea Lion Park	Removed	Lina Beecher	1895	40.5780	-73.9790	
2	Switchback Railway (Euclid Beach Park)	Cleveland, Ohio, United States	Closed	NaN	1896	41.5800	-81.5700	

```
df.plot(kind='scatter',
        x='Speed_mph',
        y= 'Height_ft',
        title= 'Coaster Speed vs Height')
plt.show()
```



```
#using seaborn
sns.scatterplot(x='Speed_mph',
                y= 'Height_ft',
                hue= 'Year_Open',
                data=df)
```

```
<Axes: xlabel='Speed_mph', ylabel='Height_ft'>
```

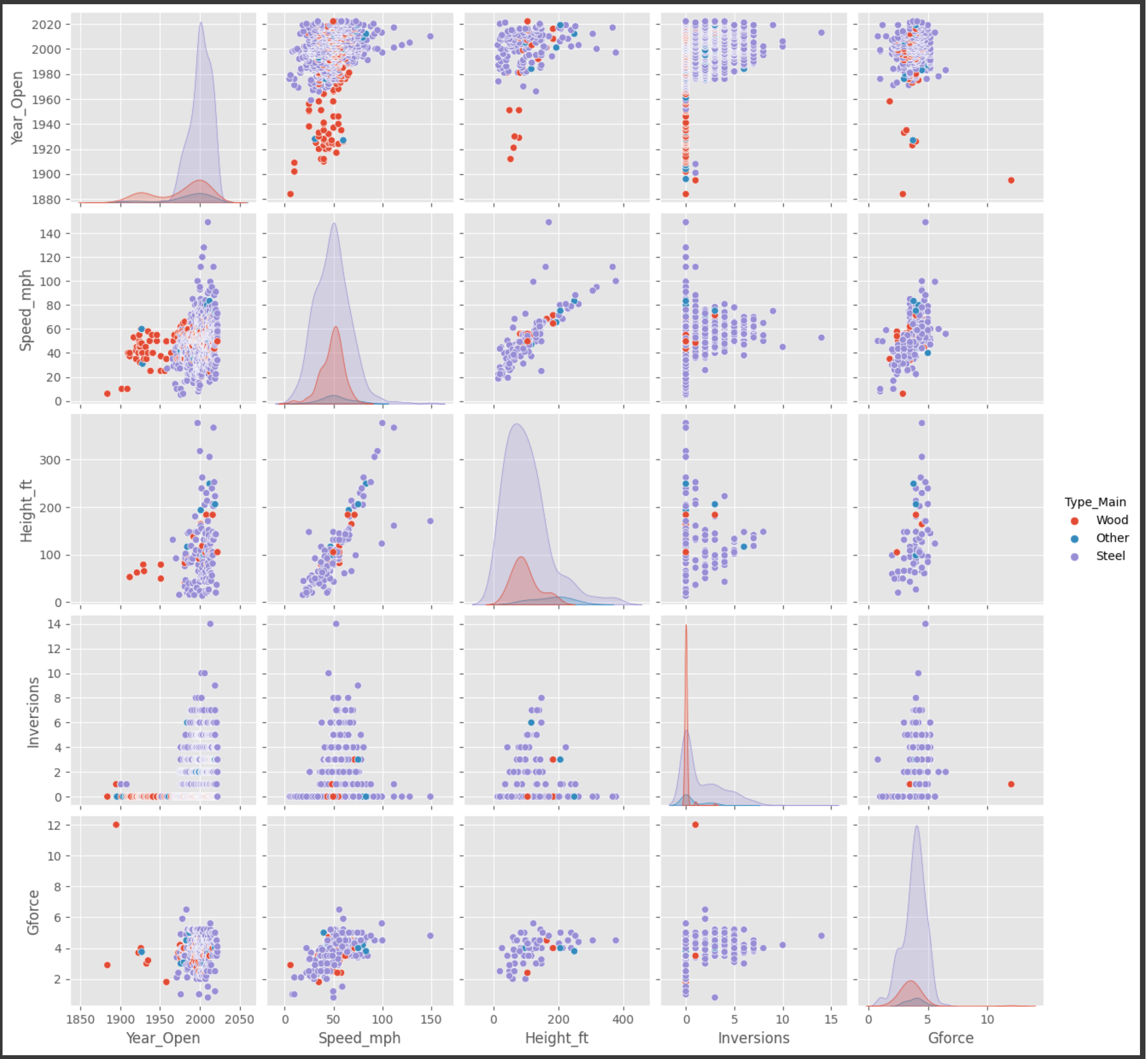


```
df.dtypes
```

```
Coaster_Name              object
Location                  object
```

```
Status                    object
Manufacturer              object
Year_Open                  int64
Latitude                 float64
Longitude                float64
Type_Main                 object
Opening_Date      datetime64[ns]
Speed_mph                float64
Height_ft                float64
Inversions                 int64
Gforce                   float64
dtype: object
```

```
#using seaborn in pairplot
sns.pairplot(df, vars=['Year_Open', 'Speed_mph', 'Height_ft', 'Inversions', 'Gforce'], hue='Type_Main')
plt.show()
```

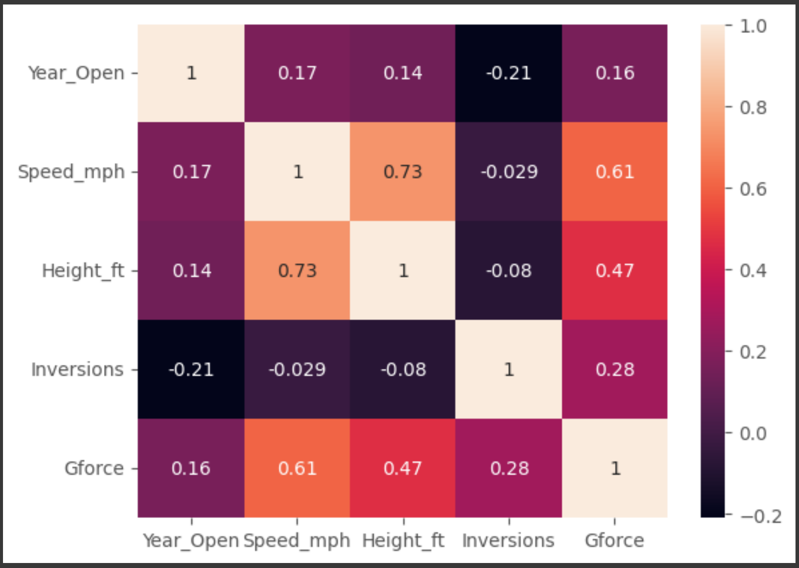


Check Correlation

```
corr_df = df[['Year_Open', 'Speed_mph', 'Height_ft', 'Inversions', 'Gforce']].dropna().corr()
#drop null and check correlation
```

```
#using heatmap to clearly see the result
sns.heatmap(corr_df, annot=True)
#annot=True for adding the corr value in graph
```

```
<Axes: >
```

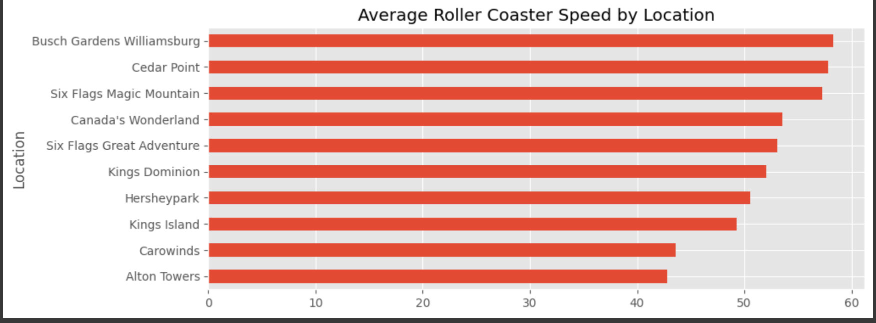


Step 5: Ask a Question about the Data

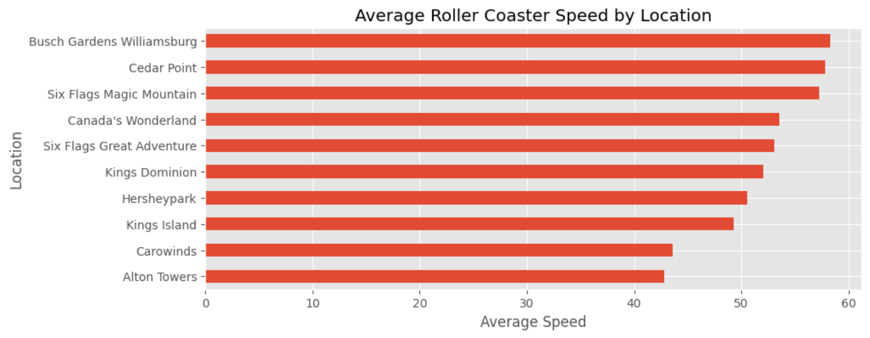
1. What are the Locations with the fastest roller coasters?

```
df.query('Location != "Other"')\
.groupby('Location')['Speed_mph']\
.agg(['mean', 'count'])\
.query('count >=10')\
.sort_values('mean')['mean']\
.plot(kind='barh', figsize=(10, 4), title='Average Roller Coaster Speed by Location')

#['Speed_mph']to count only that perticular column, we count the speed_mph data based on location group
#['mean'] yo only use mean data in plot
```

```
<Axes: title={'center': 'Average Roller Coaster Speed by Location'},
ylabel='Location'>
```



```
#edit the graph
ax = df.query('Location != "Other"')\
.groupby('Location')['Speed_mph']\
.agg(['mean', 'count'])\
.query('count >=10')\
.sort_values('mean')['mean']\
.plot(kind='barh', figsize=(10, 4), title='Average Roller Coaster Speed by Location')

ax.set_xlabel('Average Speed')
plt.show()
```


Average Roller Coaster Speed by Location
Location
Busch Gardens Williamsburg
Cedar Point
Six Flags Magic Mountain
Canada's Wonderland
Six Flags Great Adventure
Kings Dominion
Hersheypark
Kings Island
Carowinds
Alton Towers
Average Speed