Introduction

This dataset contains information on over 1000 roller coasters in the World, their name, their speed, location and other attributes

In [1]:

```
# importing modules
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from matplotlib import gridspec
import seaborn as sns
import re
```

In [26]:

```
# initializing Seaborn
sns.set_style('darkgrid')
sns.set(rc={"figure.figsize": (12,12)})
plot_color = '#08306B'
title_font = {'family': 'Comic Sans MS', 'size': 17}
label_font = {'family': 'Comic Sans MS', 'size': 14}
```

In [3]:

```
# importing the data
url = 'https://raw.githubusercontent.com/kedeisha1/Challenges/main/coaster_db.csv'

# reading the data
week7 = pd.read_csv(url)
```

In [4]:

```
# first five rows
week7.head()
```

Out[4]:

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

5 rows × 56 columns

In [5]:

```
# column names and datatype of columns
week7.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1087 entries, 0 to 1086
Data columns (total 56 columns):
 #   Column                        Non-Null Count  Dtype  
---  ------                        --------------  -----  
 0   coaster_name                  1087 non-null   object 
 1   Length                        953 non-null    object 
 2   Speed                         937 non-null    object 
 3   Location                      1087 non-null   object 
 4   Status                        874 non-null    object 
 5   Opening date                  837 non-null    object 
 6   Type                          1087 non-null   object 
 7   Manufacturer                  1028 non-null   object 
 8   Height restriction            831 non-null    object 
 9   Model                         744 non-null    object 
 10  Height                        965 non-null    object 
 11  Inversions                    932 non-null    float64
 12  Lift/launch system            795 non-null    object 
 13  Cost                          382 non-null    object 
 14  Trains                        718 non-null    object 
 15  Park section                  487 non-null    object 
 16  Duration                      765 non-null    object 
 17  Capacity                      575 non-null    object 
 18  G-force                       362 non-null    object 
 19  Designer                      578 non-null    object 
 20  Max vertical angle            357 non-null    object 
 21  Drop                          494 non-null    object 
 22  Soft opening date             96 non-null     object 
 23  Fast Lane available           69 non-null     object 
 24  Replaced                      173 non-null    object 
 25  Track layout                  335 non-null    object 
 26  Fastrack available            19 non-null     object 
 27  Soft opening date.1           96 non-null     object 
 28  Closing date                  236 non-null    object 
 29  Opened                        27 non-null     object 
 30  Replaced by                   88 non-null     object 
 31  Website                       87 non-null     object 
 32  Flash Pass Available          50 non-null     object 
 33  Must transfer from wheelchair 106 non-null    object 
 34  Theme                         44 non-null     object 
 35  Single rider line available   81 non-null     object 
 36  Restraint Style               22 non-null     object 
 37  Flash Pass available          46 non-null     object 
 38  Acceleration                  60 non-null     object 
 39  Restraints                    24 non-null     object 
 40  Name                          35 non-null     object 
 41  year_introduced               1087 non-null   int64  
 42  latitude                      812 non-null    float64
 43  longitude                     812 non-null    float64
 44  Type_Main                     1087 non-null   object 
 45  opening_date_clean            837 non-null    object 
 46  speed1                        937 non-null    object 
 47  speed2                        935 non-null    object 
 48  speed1_value                  937 non-null    float64
 49  speed1_unit                   937 non-null    object 
 50  speed_mph                     937 non-null    float64
 51  height_value                  965 non-null    float64
 52  height_unit                   965 non-null    object 
 53  height_ft                     171 non-null    float64
 54  Inversions_clean              1087 non-null   int64  
 55  Gforce_clean                  362 non-null    float64
dtypes: float64(8), int64(2), object(46)
memory usage: 475.7+ KB
```

In [6]:

```
# statistical description of data
week7.describe()
```

Out[6]:

	Inversions	year_introduced	latitude	longitude	speed1_value	speed_mph	height_value	height_ft

count	932.000000	1087.000000	812.000000	812.000000	937.000000	937.000000	965.000000	171.000000
mean	1.547210	1994.986201	38.373484	-41.595373	53.850374	48.617289	89.575171	101.996491
std	2.114073	23.475248	15.516596	72.285227	23.385518	16.678031	136.246444	67.329092
min	0.000000	1884.000000	-48.261700	-123.035700	5.000000	5.000000	4.000000	13.100000
25%	0.000000	1989.000000	35.031050	-84.552200	40.000000	37.300000	44.000000	51.800000
50%	0.000000	2000.000000	40.289800	-76.653600	50.000000	49.700000	79.000000	91.200000
75%	3.000000	2010.000000	44.799600	2.778100	63.000000	58.000000	113.000000	131.200000
max	14.000000	2022.000000	63.230900	153.426500	240.000000	149.100000	3937.000000	377.300000

In [7]:

```
# renaming some columns
week7.rename({'coaster_name':'Coaster_Name', 'year_introduced':'Year_Introduced',
                'opening_date_clean':'Opening_Date', 'speed_mph':'Speed_mph',
                'height_ft':'Height_ft', 'Inversions_clean':'inversions',
                'Gforce_clean':'Gforce'},
                axis= 1, inplace=True)

week7.columns
```

Out[7]:

```
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',
       'speed1', 'speed2', 'speed1_value', 'speed1_unit', 'Speed_mph',
       'height_value', 'height_unit', 'Height_ft', 'inversions', 'Gforce'],
      dtype='object')
```

In [8]:

```
# number of rows and columns
shape = week7.shape
print(f'The dataset has {shape[0]} rows and {shape[1]} columns')
```

```
The dataset has 1087 rows and 56 columns
```

In [9]:

```
# checking for outliers in the speed
week7[week7['Speed_mph'] >= 100]
```

Out[9]:

	Coaster_Name	Length	Speed	Location	Status	Opening date	Type	Manufacturer	res
429	Superman: Escape from Krypton	1,235 ft (376.4 m)	100 mph (160.9 km/h)	Other	Operating	March 15, 1997	Steel – Launched – Shuttle – Dueling	Intamin	(
431	Tower of Terror II	376.4 m (1,235 ft)	160.9 km/h (100.0 mph)	Dreamworld	Removed	23 January 1997Tower of Terror)	Steel – Launched – Shuttle	Intamin	(3
569	Do-Dodonpa	1,244 m (4,081 ft)	180 km/h (110 mph)	Fuji-Q Highland	Closed	21 December 2001	Steel	S&S – Sansei Technologies	(4
642	Top Thrill	2,800 ft	120	Cedar Point	Closed	May 4, 2003	Steel –	Intamin	

	Dragster	(850 m)	mph (190 km/h)				Launched		
685	Kingda Ka	3,118 ft (950 m)	128 mph (206 km/h)	Six Flags Great Adventure	Operating	May 21, 2005	Steel – Launched	Intamin	5
812	Formula Rossa	2,000 m (6,562 ft)	240 km/h (149.1 mph)	Ferrari World Abu Dhabi	Operating	4 November 2010	Steel – Launched	Intamin	(4 6
993	Red Force (roller coaster)	880 m (2,890 ft)	180 km/h (112 mph)	Ferrari Land	Operating	7 April 2017	Steel – Launched	Intamin	(4 6

7 rows × 56 columns

Are there any duplicated rows?

In [10]:

```python
# number of duplicated rows
n_duplicated = week7.duplicated().sum()
print(f'There are {n_duplicated} duplicated rows')
```

```
There are 0 duplicated rows
```

In [11]:

```python
n_duplicated_name = week7.duplicated(subset=['Coaster_Name']).sum()
print(f'Although there are {n_duplicated_name} roller coasters with the same name')
```

```
Although there are 97 roller coasters with the same name
```

What are the top 3 years with the most roller coasters introduced?

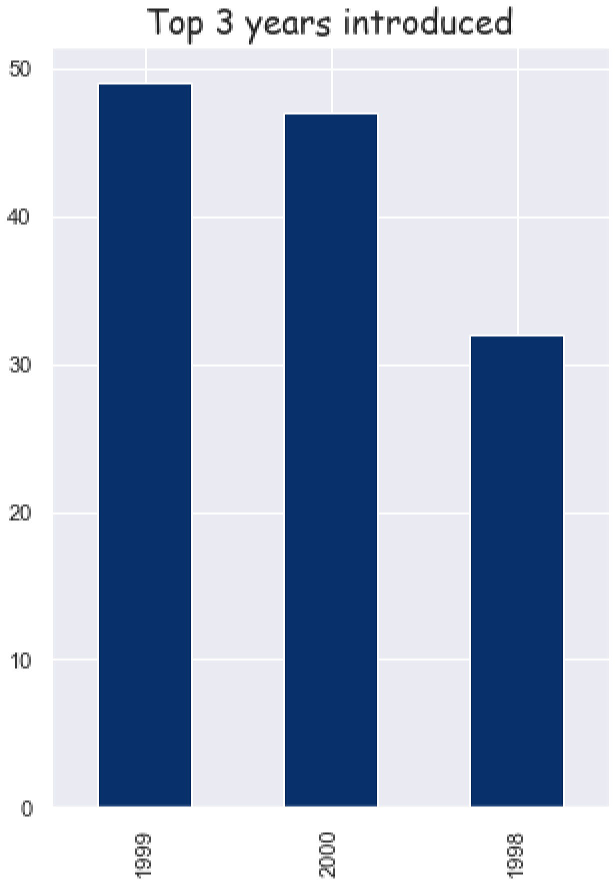
In [12]:

```python
# top 3 years
top_3 = week7['Year_Introduced'].value_counts()[:3].index.values
print(f'The top 3 years with the most roller coasters are {top_3}')
```

```
The top 3 years with the most roller coasters are [1999 2000 1998]
```

In [13]:

```python
# graph of top 3 years
plt.figure(figsize=[5,7])
week7['Year_Introduced'].value_counts()[:3].sort_values(ascending=False).plot(kind='bar'
plt.title('Top 3 years introduced', fontdict=title_font);
```



What is the average speed? Also display a plot to show it's distribution.

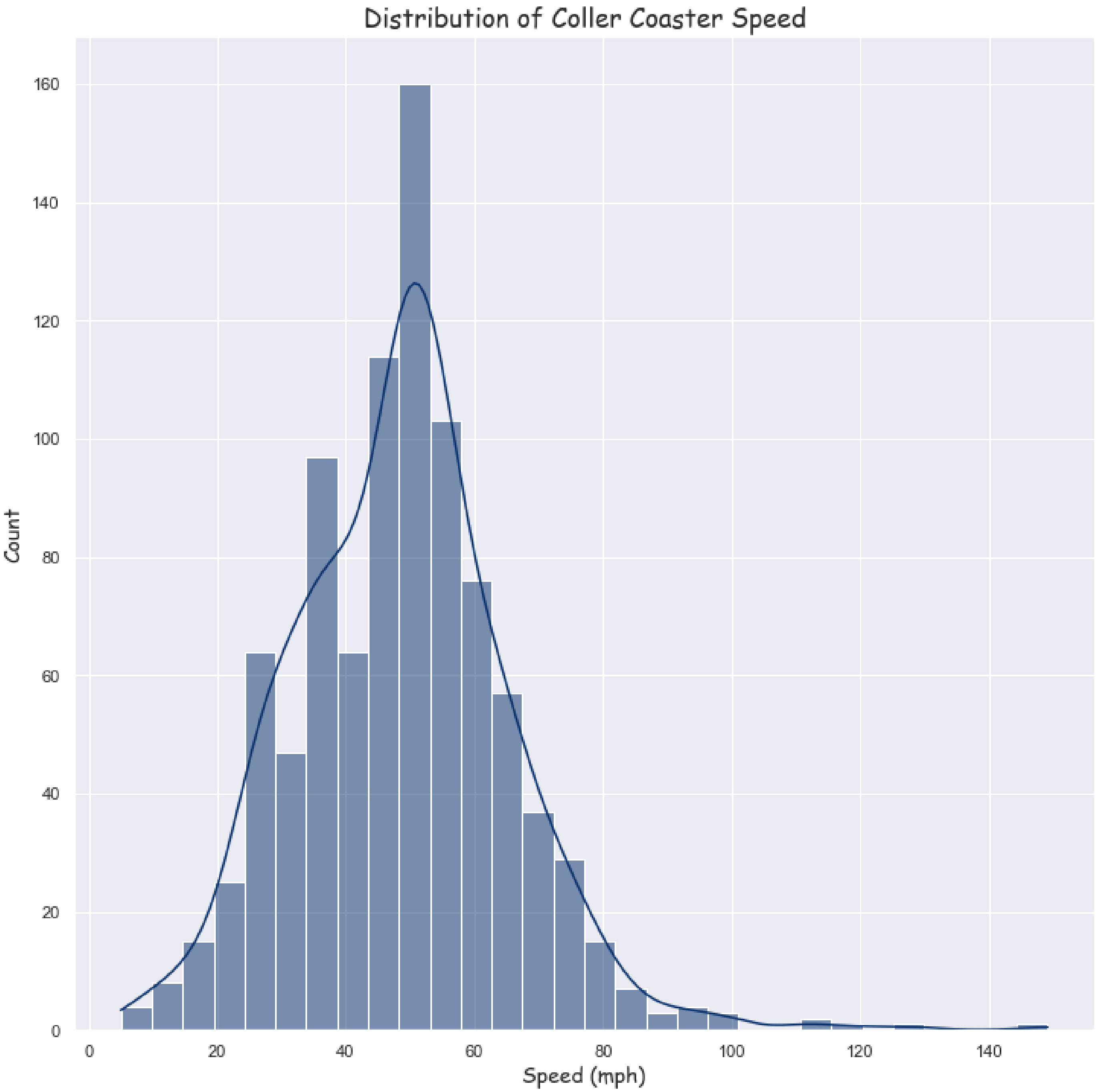
In [14]:

```
# getting the average speed
average_speed = week7['speed1_value'].mean()
print(f'The Average speed is {average_speed} mph')
```

```
The Average speed is 53.8503735325507 mph
```

In [27]:

```
# histogram showing the distribution of roller coaster speed
sns.histplot(week7['Speed_mph'], color=plot_color, kde=True, bins=30)

# display graph labels
plt.title("Distribution of Coller Coaster Speed", fontdict=title_font)
plt.xlabel('Speed (mph)', fontdict=label_font)
plt.ylabel('Count', fontdict=label_font);
```



The distribution is right skewed with most roller coasters having speed between 40 and 50 mph. There are exceptions like the Formula Rossa in Dubai which goes up to 150 mph and Kingda Ka and Top Thrill Dragster in US which goes above 12 mph

Explore the feature relationships. Are there any positively or negatively correlated relationships?

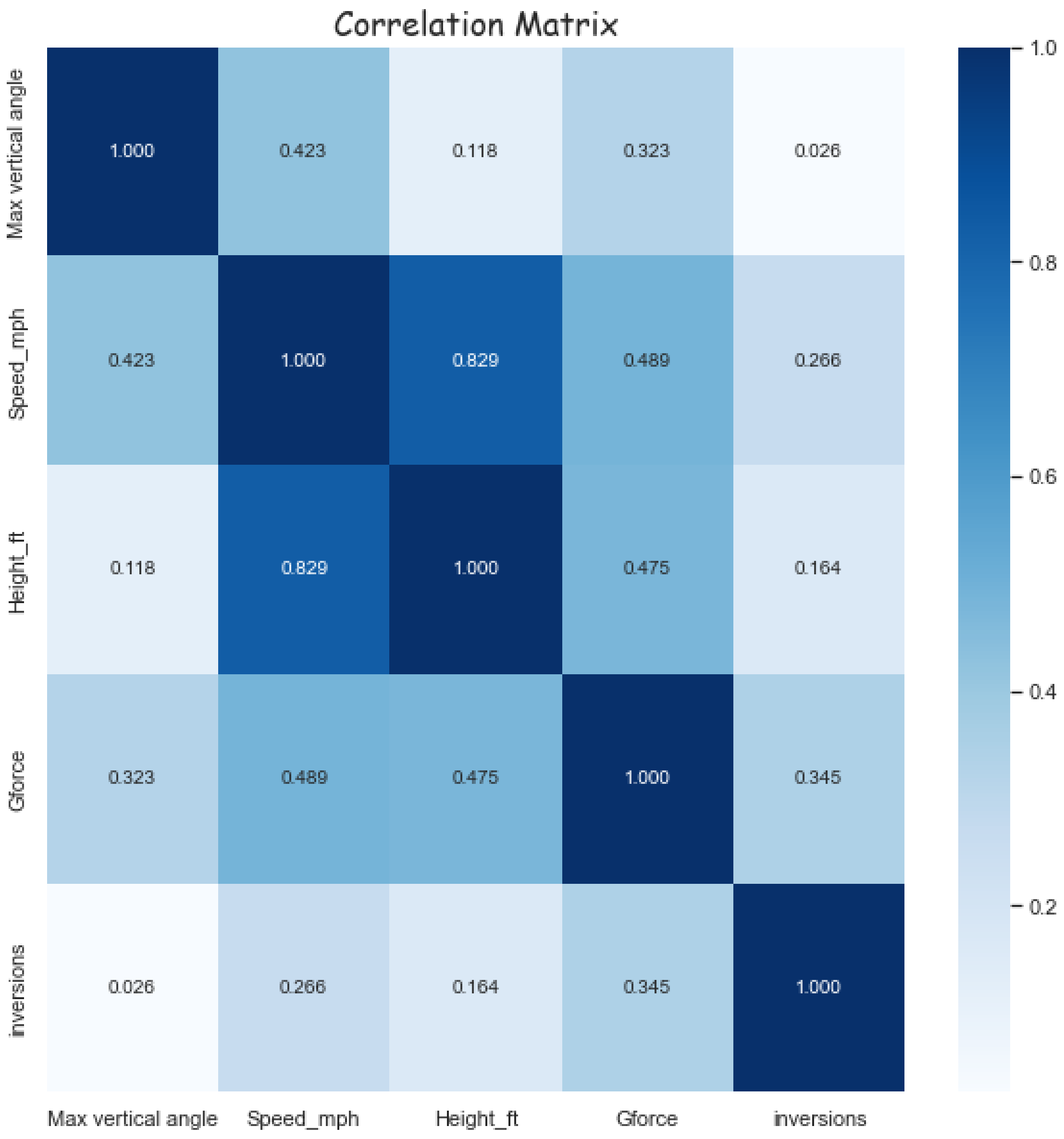
In [16]:

```
# extract number from the Max vertical angle column
week7['Max vertical angle'] = week7['Max vertical angle'].str.\
        extract(r'([0-9]{2})').astype('float')
```

In [17]:

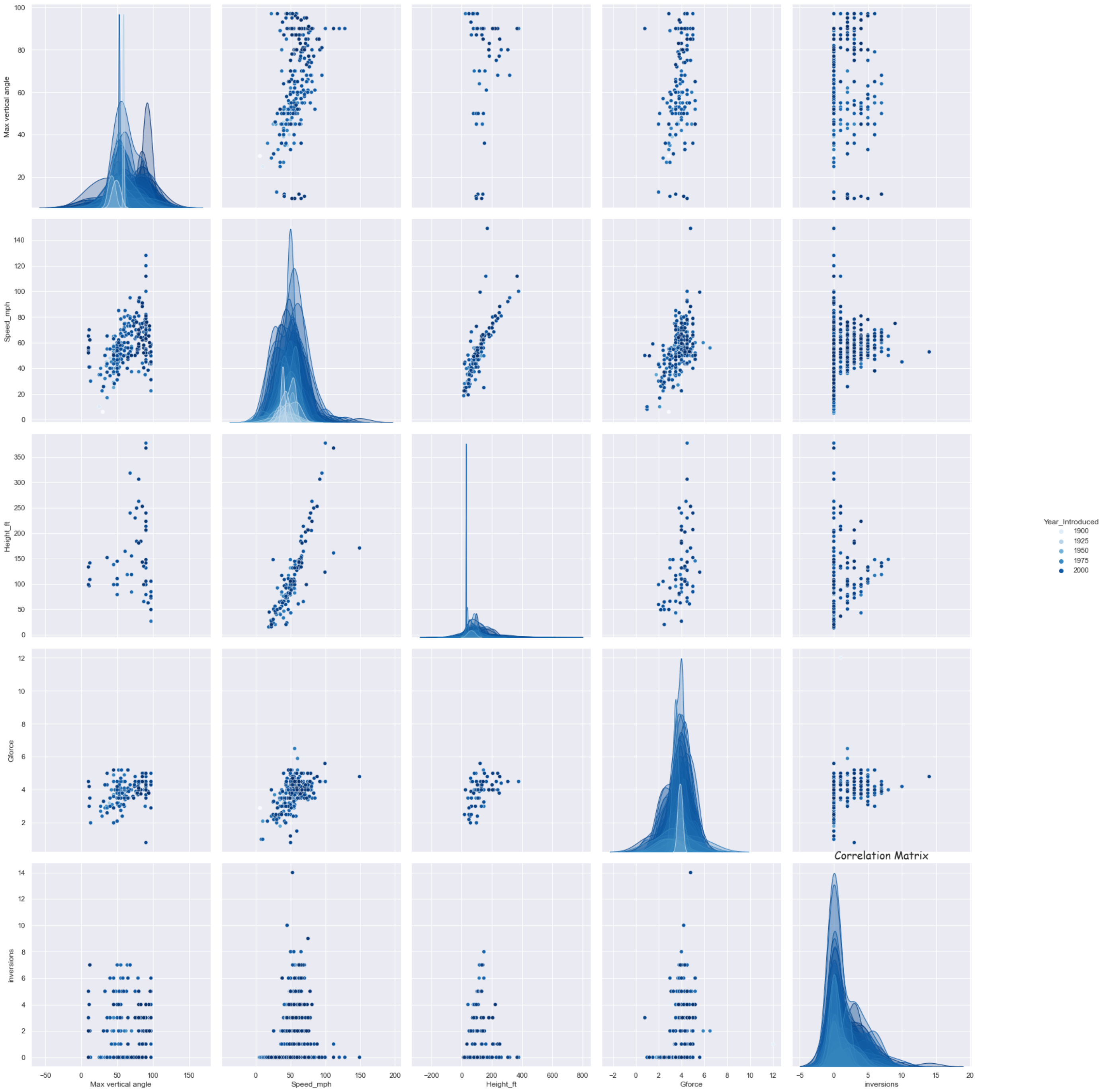
```
# define the variables to be used
vars=week7[['Max vertical angle', 'Speed_mph', 'Height_ft', 'Gforce', 'inversions']]

# set figure size
plt.figure(figsize=[10,10])

# plot heatmap
```

```
sns.heatmap(vars.corr(), annot = True, fmt = '.3f', cmap='Blues')

# display graph labels
plt.title('Correlation Matrix', fontdict=title_font);
```



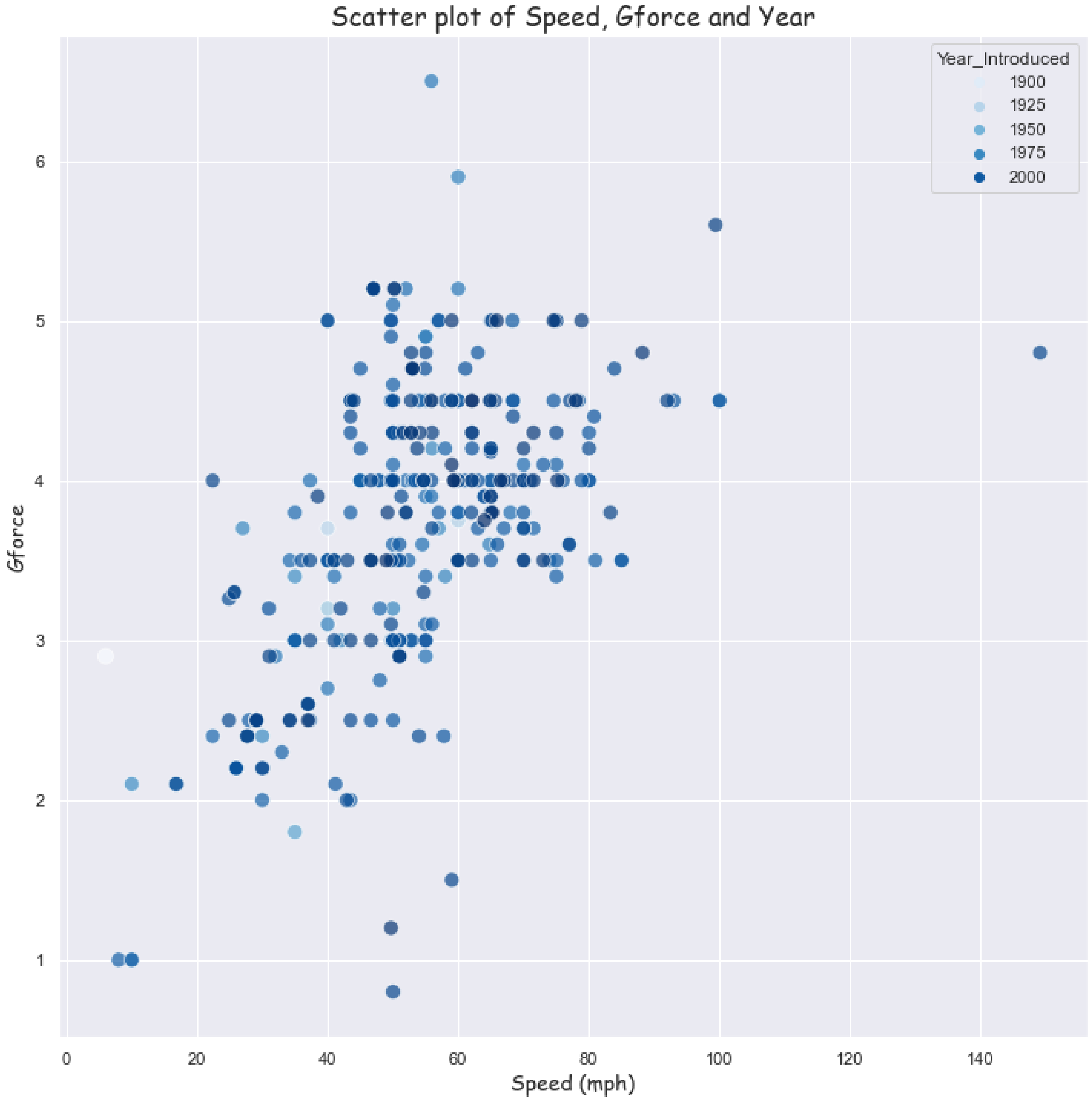
There is a positive correlation between height and speed. Other pairs don't seem to have significant correlation.

In [18]:
```
# correlational matrix
s = sns.pairplot(week7, vars=['Max vertical angle', 'Speed_mph',
                                'Height_ft', 'Gforce', 'inversions'],
                                hue='Year_Introduced', palette='Blues').\
                                    fig.set_size_inches(25,25)

# display graph title
plt.title('Correlation Matrix', fontdict=title_font);
```



In [28]:

```
# scatter plot for speed, gforce and year introduced
sns.scatterplot(data=week7, x='Speed_mph', y='Gforce', hue='Year_Introduced', s=100,
                alpha = 0.7, palette='Blues')

# display graph labels
plt.title('Scatter plot of Speed, Gforce and Year', fontdict = title_font)
plt.ylabel('Gforce', fontdict=label_font)
plt.xlabel('Speed (mph)', fontdict=label_font);
```



Later models tend to have higher speed and Gforce

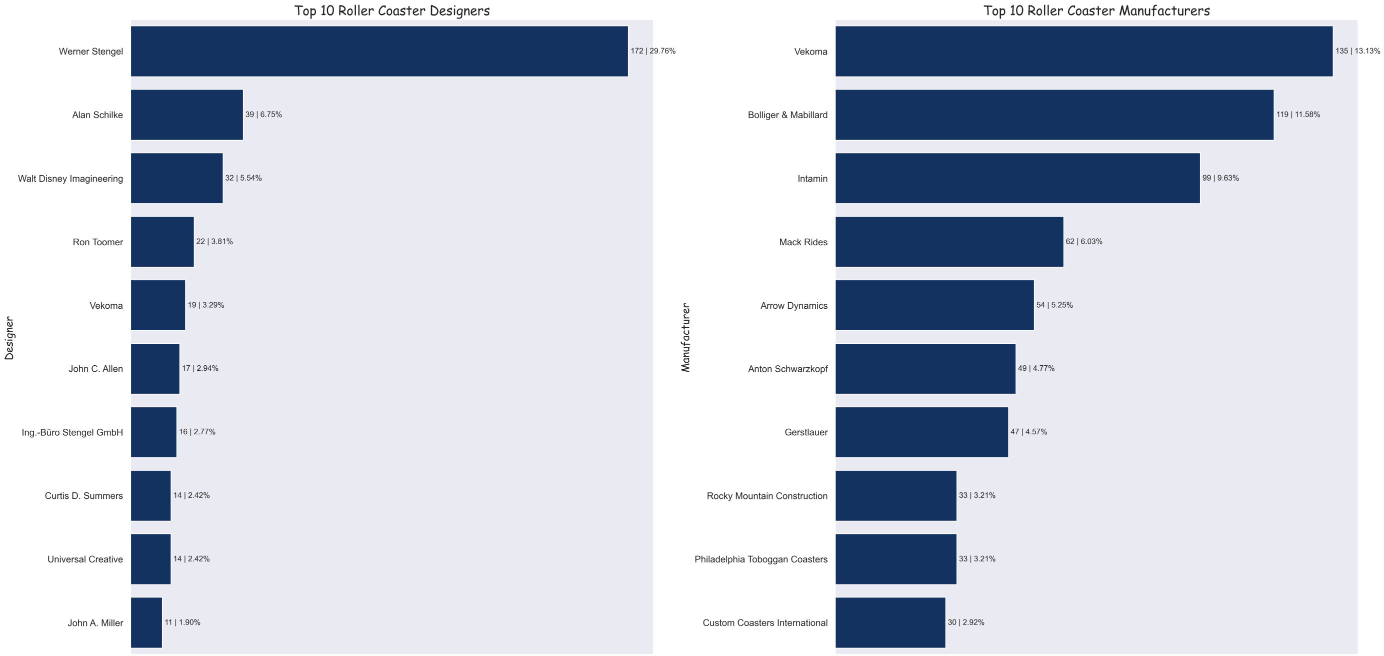
Additional Plots

In [20]:

```
def count_plot(no:int, y, title, ylabel):
    '''This function plots count in group of two'''

    # arrange the bars in order of frequency
    count_a = y.value_counts()[:10]
    count_b = y.value_counts(normalize = True)*100

    # set subplots
    ax = plt.subplot(1,2,no,)

    # plot the countplot
    ax1 =sns.countplot(y = y, order = count_a.index, color=plot_color)

    # setting labels
    label = [f' {p[0]} | {p[1]:.2f}%' for p in zip(count_a, count_b)]
    ax1.bar_label(container=ax.containers[0], labels=label)

    # display graph labels
    plt.title(title, fontdict = title_font)
    plt.ylabel(ylabel, fontdict = label_font)
    plt.xlabel('')
    plt.xticks([])
    plt.yticks(fontsize = 12)

    # prevent overflow of labels
    plt.tight_layout()
```

In [21]:

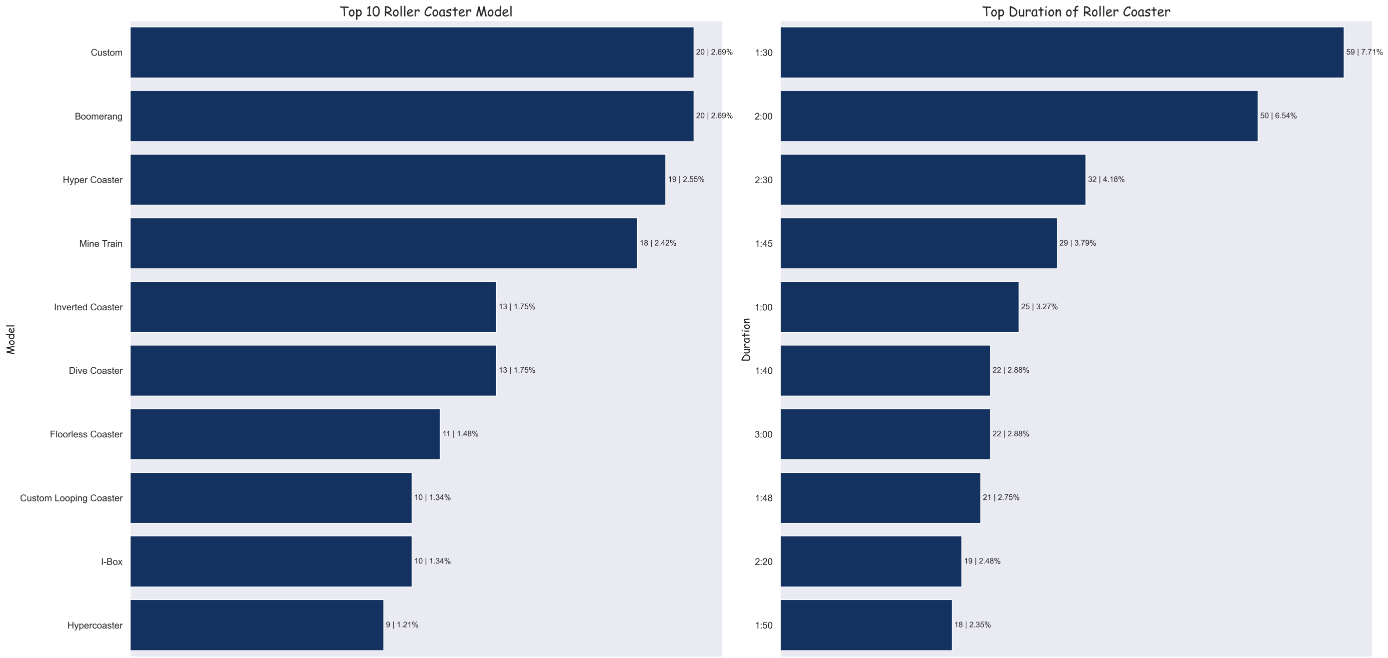
```
# count plot for Designers and Manufacturers
plt.figure(figsize=[25,12], dpi=300)
count_plot(1, week7['Designer'], 'Top 10 Roller Coaster Designers', 'Designer')
count_plot(2, week7['Manufacturer'], 'Top 10 Roller Coaster Manufacturers', 'Manufacture
```



The top designer of roller coaster is Warner Stengel and the Top manufacturer is Vekoma. Vekoma also designs roller coaster but only 19 from our dataset were designed by Vekoma.

In [22]:

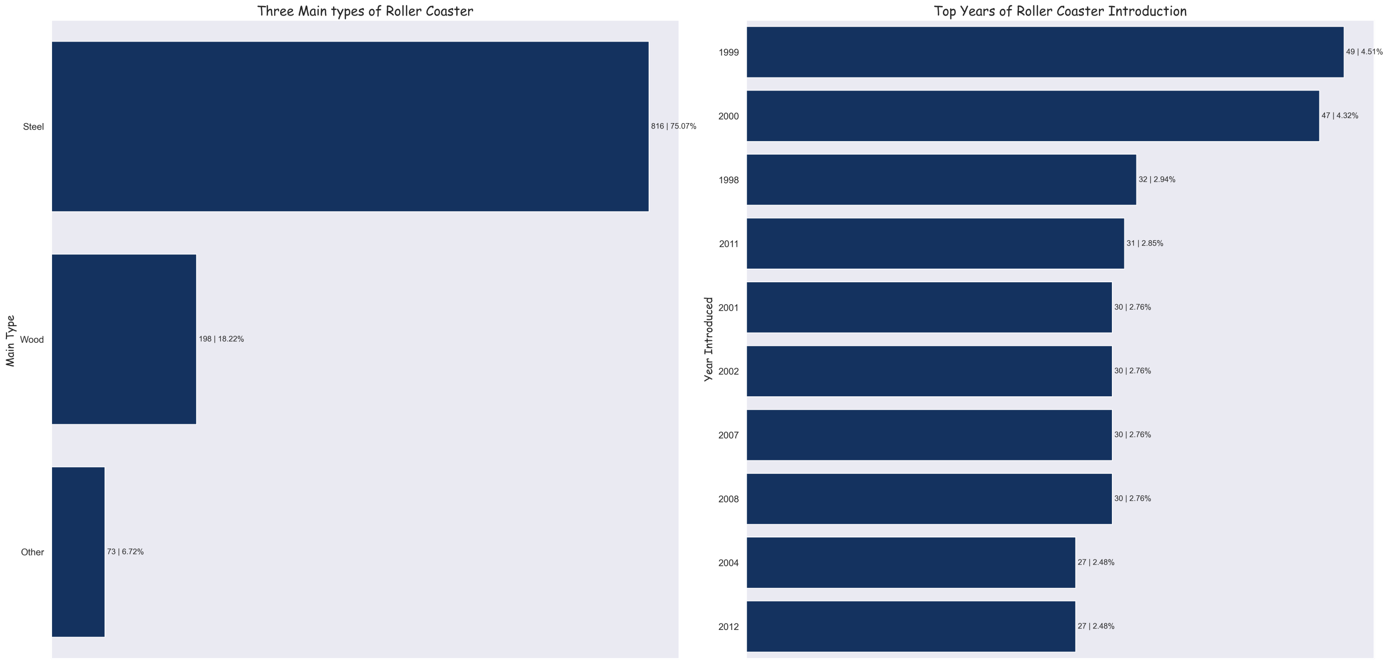
```
# count plot for Models and Duration
plt.figure(figsize=[25,12], dpi=300)
count_plot(1, week7['Model'], 'Top 10 Roller Coaster Model', 'Model')
count_plot(2, week7['Duration'], 'Top Duration of Roller Coaster', 'Duration')
```



The top model for roller coaster is a tie between Custom and Boomerang. The top duration which the ride lasts for is 1 minute 30 seconds followed by 2 minutes.

In [23]:

```
# count plot for Year Introduced and Main Type
plt.figure(figsize=[25,12], dpi=300)
count_plot(1, week7['Type_Main'], 'Three Main types of Roller Coaster', 'Main Type ')
count_plot(2, week7['Year_Introduced'], 'Top Years of Roller Coaster Introduction', 'Yea
```



The three main type of roller coasters are Steel, Wood and others. 1999 saw the most introduction of roller coasters at 49 followed by 2000 at 47. This could be an indication of a boom in the popularity of roller coasters in the 90's and early 2000's.

In [30]:

```
!jupyter nbconvert --to webpdf --allow-chromium-download Week_7_pandas.ipynb
```

```
[NbConvertApp] Converting notebook Week_7_pandas.ipynb to webpdf
[NbConvertApp] Building PDF
[NbConvertApp] PDF successfully created
[NbConvertApp] Writing 2218080 bytes to Week_7_pandas.pdf
```

In [ ]: