In [8]:
```
import pandas as pd
df = pd.read_csv('Motor_Vehicle_Collisions_-_Crashes.csv')

# Display information about duplicates before removal
print("Number of duplicates before removal:", df.duplicated().sum())

# Remove duplicates
df_no_duplicates = df.drop_duplicates()

# Display information about duplicates after removal
print("Number of duplicates after removal:", df_no_duplicates.duplicated().sum())

# Save the dataset without duplicates to a new CSV file
df_no_duplicates.to_csv('dataset_no_duplicates.csv', index=False)
```

```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/3883987385.py:2: DtypeWarning: Columns (3,5,
14,16) have mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('Motor_Vehicle_Collisions_-_Crashes.csv')
Number of duplicates before removal: 1
Number of duplicates after removal: 0
```

In [9]:
```
#Missing Values
df = pd.read_csv('dataset_no_duplicates.csv')
print("Original Dataset Info:")
print(df.info())
# Step 1: Drop columns with a high percentage of missing values (adjust threshold as needed)
threshold = 0.8
df = df.dropna(thresh=len(df) * (1 - threshold), axis=1)
# Step 2: Drop rows with missing values
df = df.dropna(axis=0)
#Dropping columns that are not used in computation/analysis
columns_to_drop = ['CRASH TIME','ON STREET NAME','CROSS STREET NAME', 'CONTRIBUTING FACTOR VEHICLE 2','VEHICL
df = df.drop(columns=columns_to_drop, axis=1)
# Display information about cleaned dataset
print("\nCleaned Dataset Info:")
print(df.info())
# Save the cleaned dataset to a new CSV file
df.to_csv('cleaned_data.csv', index=False)
```

```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/3399425813.py:2: DtypeWarning: Columns (3,5,
14,16) have mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('dataset_no_duplicates.csv')
```

```
Original Dataset Info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2057583 entries, 0 to 2057582
Data columns (total 29 columns):
 #   Column                          Dtype
---  ------                          -----
 0   CRASH DATE                      object
 1   CRASH TIME                      object
 2   BOROUGH                         object
 3   ZIP CODE                        object
 4   LATITUDE                        float64
 5   LONGITUDE                       object
 6   LOCATION                        object
 7   ON STREET NAME                  object
 8   CROSS STREET NAME               object
 9   OFF STREET NAME                 object
 10  NUMBER OF PERSONS INJURED       float64
 11  NUMBER OF PERSONS KILLED        float64
 12  NUMBER OF PEDESTRIANS INJURED   int64
 13  NUMBER OF PEDESTRIANS KILLED    int64
 14  NUMBER OF CYCLIST INJURED       object
 15  NUMBER OF CYCLIST KILLED        int64
 16  NUMBER OF MOTORIST INJURED      object
 17  NUMBER OF MOTORIST KILLED       float64
 18  CONTRIBUTING FACTOR VEHICLE 1   object
 19  CONTRIBUTING FACTOR VEHICLE 2   object
 20  CONTRIBUTING FACTOR VEHICLE 3   object
 21  CONTRIBUTING FACTOR VEHICLE 4   object
 22  CONTRIBUTING FACTOR VEHICLE 5   object
 23  COLLISION_ID                    float64
 24  VEHICLE TYPE CODE 1             object
 25  VEHICLE TYPE CODE 2             object
 26  VEHICLE TYPE CODE 3             object
 27  VEHICLE TYPE CODE 4             object
 28  VEHICLE TYPE CODE 5             object
dtypes: float64(5), int64(3), object(21)
memory usage: 455.2+ MB
None

Cleaned Dataset Info:
<class 'pandas.core.frame.DataFrame'>
Index: 886577 entries, 10 to 2057580
Data columns (total 17 columns):
 #   Column                          Non-Null Count   Dtype
---  ------                          --------------   -----
```

```
 0   CRASH DATE                     886577 non-null  object
 1   BOROUGH                        886577 non-null  object
 2   ZIP CODE                       886577 non-null  object
 3   LATITUDE                       886577 non-null  float64
 4   LONGITUDE                      886577 non-null  object
 5   LOCATION                       886577 non-null  object
 6   NUMBER OF PERSONS INJURED      886577 non-null  float64
 7   NUMBER OF PERSONS KILLED       886577 non-null  float64
 8   NUMBER OF PEDESTRIANS INJURED  886577 non-null  int64
 9   NUMBER OF PEDESTRIANS KILLED   886577 non-null  int64
 10  NUMBER OF CYCLIST INJURED      886577 non-null  object
 11  NUMBER OF CYCLIST KILLED       886577 non-null  int64
 12  NUMBER OF MOTORIST INJURED     886577 non-null  object
 13  NUMBER OF MOTORIST KILLED      886577 non-null  float64
 14  CONTRIBUTING FACTOR VEHICLE 1  886577 non-null  object
 15  COLLISION_ID                   886577 non-null  float64
 16  VEHICLE TYPE CODE 1            886577 non-null  object
dtypes: float64(5), int64(3), object(9)
memory usage: 121.8+ MB
None
```

In [10]:

```python
from sklearn.preprocessing import MinMaxScaler
# Identify columns with different data types
string_cols = ['BOROUGH','ZIP CODE','LOCATION','CONTRIBUTING FACTOR VEHICLE 1','VEHICLE TYPE CODE 1','CRASH D
int_cols = ['NUMBER OF PERSONS INJURED', 'NUMBER OF PERSONS KILLED', 'NUMBER OF PEDESTRIANS INJURED',
            'NUMBER OF PEDESTRIANS KILLED', 'NUMBER OF CYCLIST INJURED', 'NUMBER OF CYCLIST KILLED',
            'NUMBER OF MOTORIST INJURED', 'NUMBER OF MOTORIST KILLED', 'COLLISION_ID']
float_cols = ['LATITUDE', 'LONGITUDE']  # Replace with your float columns

# Step 1: Normalize numerical columns using Min-Max scaling
numerical_cols = int_cols + float_cols
scaler = MinMaxScaler()
df_normalized = df.copy()
df_normalized[numerical_cols] = scaler.fit_transform(df[numerical_cols])

# Step 2: Assign specific data types to columns
df_normalized[string_cols] = df_normalized[string_cols].astype(str)
df_normalized['CRASH DATE'] = pd.to_datetime(df['CRASH DATE'], format='%m/%d/%Y')
df_normalized[int_cols] = df_normalized[int_cols].astype(int)
df_normalized[float_cols] = df_normalized[float_cols].astype(float)

# Display information about the normalized and typed dataset
print("\nNormalized and Typed Dataset Info:")
print(df_normalized.info())
```

```
# Save the normalized and typed dataset to a new CSV file
df_normalized.to_csv('normalized_typed_data.csv', index=False)
```

```
Normalized and Typed Dataset Info:
<class 'pandas.core.frame.DataFrame'>
Index: 886577 entries, 10 to 2057580
Data columns (total 17 columns):
 #   Column                         Non-Null Count   Dtype         
---  ------                         --------------   -----         
 0   CRASH DATE                     886577 non-null  datetime64[ns]
 1   BOROUGH                        886577 non-null  object        
 2   ZIP CODE                       886577 non-null  object        
 3   LATITUDE                       886577 non-null  float64       
 4   LONGITUDE                      886577 non-null  float64       
 5   LOCATION                       886577 non-null  object        
 6   NUMBER OF PERSONS INJURED      886577 non-null  int64         
 7   NUMBER OF PERSONS KILLED       886577 non-null  int64         
 8   NUMBER OF PEDESTRIANS INJURED  886577 non-null  int64         
 9   NUMBER OF PEDESTRIANS KILLED   886577 non-null  int64         
 10  NUMBER OF CYCLIST INJURED      886577 non-null  int64         
 11  NUMBER OF CYCLIST KILLED       886577 non-null  int64         
 12  NUMBER OF MOTORIST INJURED     886577 non-null  int64         
 13  NUMBER OF MOTORIST KILLED      886577 non-null  int64         
 14  CONTRIBUTING FACTOR VEHICLE 1  886577 non-null  object        
 15  COLLISION_ID                   886577 non-null  int64         
 16  VEHICLE TYPE CODE 1            886577 non-null  object        
dtypes: datetime64[ns](1), float64(2), int64(9), object(5)
memory usage: 121.8+ MB
None
```

In [ ]:

```
from sklearn.preprocessing import LabelEncoder, OneHotEncoder

# Load your dataset
df = pd.read_csv('normalized_typed_data.csv')

# Identify categorical columns
categorical_cols = ['BOROUGH', 'VEHICLE TYPE CODE 1', 'CONTRIBUTING FACTOR VEHICLE 1']  # Replace with your c

# Method 1: Label Encoding
label_encoder = LabelEncoder()
for col in categorical_cols:
    df[col + '_encoded'] = label_encoder.fit_transform(df[col])

# Method 2: One-Hot Encoding
df_one_hot = pd.get_dummies(df, columns=categorical_cols, prefix=categorical_cols)
```

```
# Display information about the dataset with encoded variables
print("\nDataset Info with Label Encoded Variables:")
print(df.info())

print("\nDataset Info with One-Hot Encoded Variables:")
print(df_one_hot.info())

# Save the datasets with encoded variables to new CSV files
df.to_csv('label_encoded_data.csv', index=False)
df_one_hot.to_csv('one_hot_encoded_data.csv', index=False)
```

```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/1265958482.py:4: DtypeWarning: Columns (2) h
ave mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('normalized_typed_data.csv')
```

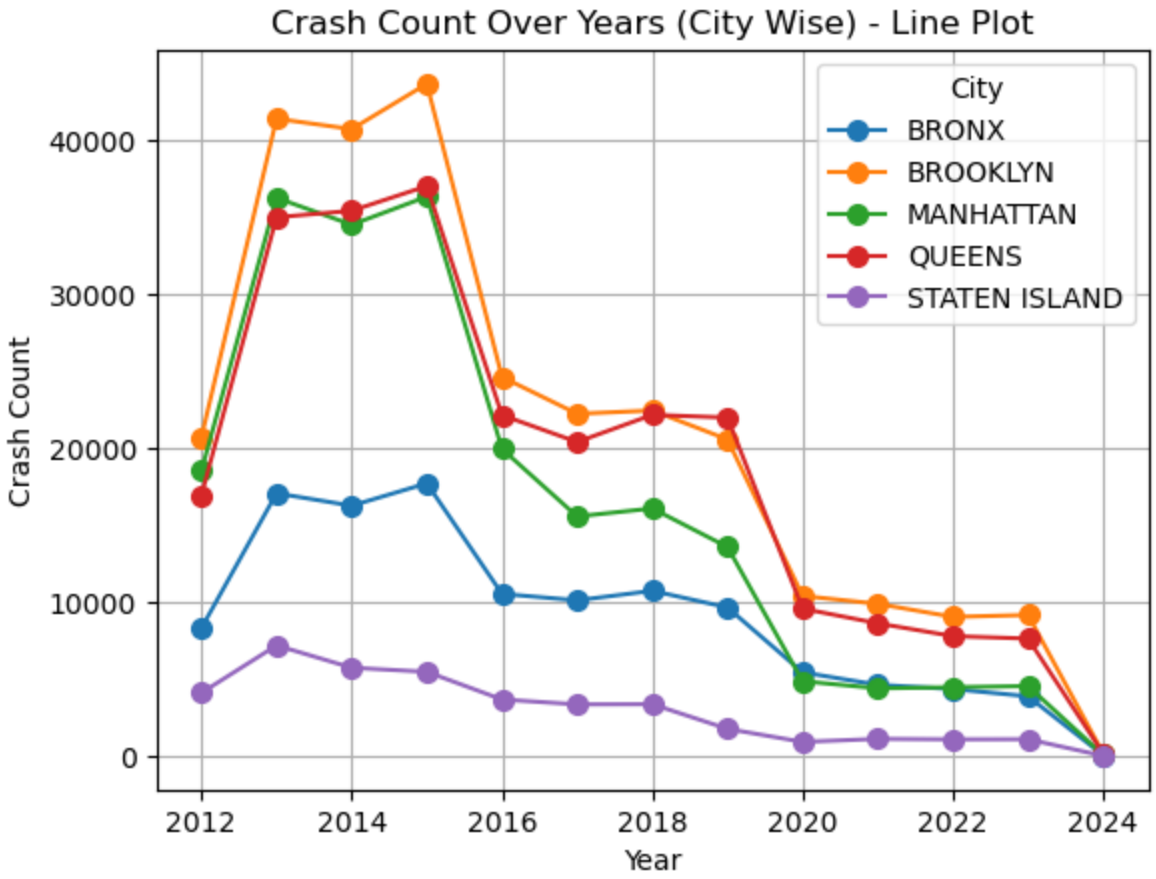
```
Dataset Info with Label Encoded Variables:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 886577 entries, 0 to 886576
Data columns (total 20 columns):
 #   Column                                 Non-Null Count   Dtype
---  ------                                 --------------   -----
 0   CRASH DATE                             886577 non-null  object
 1   BOROUGH                                886577 non-null  object
 2   ZIP CODE                               886577 non-null  object
 3   LATITUDE                               886577 non-null  float64
 4   LONGITUDE                              886577 non-null  float64
 5   LOCATION                               886577 non-null  object
 6   NUMBER OF PERSONS INJURED              886577 non-null  int64
 7   NUMBER OF PERSONS KILLED               886577 non-null  int64
 8   NUMBER OF PEDESTRIANS INJURED          886577 non-null  int64
 9   NUMBER OF PEDESTRIANS KILLED           886577 non-null  int64
 10  NUMBER OF CYCLIST INJURED              886577 non-null  int64
 11  NUMBER OF CYCLIST KILLED               886577 non-null  int64
 12  NUMBER OF MOTORIST INJURED             886577 non-null  int64
 13  NUMBER OF MOTORIST KILLED              886577 non-null  int64
 14  CONTRIBUTING FACTOR VEHICLE 1          886577 non-null  object
 15  COLLISION_ID                           886577 non-null  int64
 16  VEHICLE TYPE CODE 1                    886577 non-null  object
 17  BOROUGH_encoded                        886577 non-null  int64
 18  VEHICLE TYPE CODE 1_encoded            886577 non-null  int64
 19  CONTRIBUTING FACTOR VEHICLE 1_encoded  886577 non-null  int64
dtypes: float64(2), int64(12), object(6)
memory usage: 135.3+ MB
None

Dataset Info with One-Hot Encoded Variables:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 886577 entries, 0 to 886576
Columns: 797 entries, CRASH DATE to CONTRIBUTING FACTOR VEHICLE 1_Windshield Inadequate
dtypes: bool(780), float64(2), int64(12), object(3)
memory usage: 774.5+ MB
None
```

In [12]:

```python
#Crash Count VS Year (City WISE)
import pandas as pd
import matplotlib.pyplot as plt

# Load the dataset (replace 'your_data.csv' with the actual file path)
data = pd.read_csv('normalized_typed_data.csv')
```

```
# Convert 'CRASH DATE' column to datetime
data['CRASH DATE'] = pd.to_datetime(data['CRASH DATE'])

# Extract year from 'CRASH DATE'
data['Year'] = data['CRASH DATE'].dt.year

# Group by year and city (Borough) and count the number of crashes
crashes_per_year_city = data.groupby(['Year', 'BOROUGH']).size().reset_index(name='Crash Count')

# Pivot the data to have years as rows and cities (Borough) as columns
pivot_table = crashes_per_year_city.pivot(index='Year', columns='BOROUGH', values='Crash Count')

# Line Plot
plt.figure(figsize=(20, 10))
pivot_table.plot(kind='line', marker='o', markersize=7)
plt.title('Crash Count Over Years (City Wise) - Line Plot')
plt.xlabel('Year')
plt.ylabel('Crash Count')
plt.grid(True)
plt.legend(title='City')
plt.show()
```

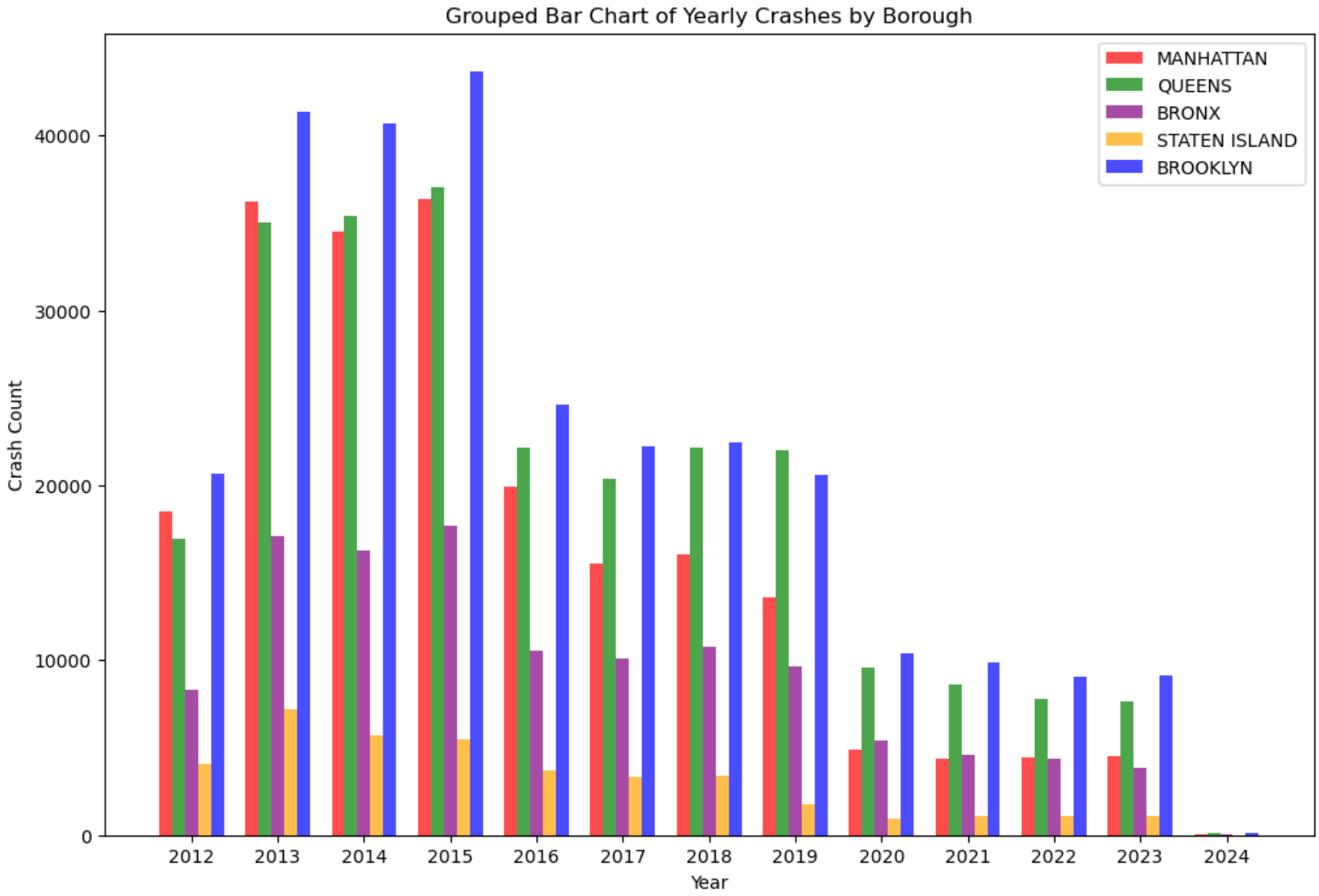
```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/2386720700.py:6: DtypeWarning: Columns (2) h
ave mixed types. Specify dtype option on import or set low_memory=False.
  data = pd.read_csv('normalized_typed_data.csv')
<Figure size 2000x1000 with 0 Axes>
```



In [6]:
```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np

# Load your dataset
df = pd.read_csv('normalized_typed_data.csv')  # Replace with your actual dataset file

# Convert 'CRASH DATE' to datetime if not already done
df['CRASH DATE'] = pd.to_datetime(df['CRASH DATE'],  errors='coerce', infer_datetime_format=True)  # Adjust t

# Extract year from 'CRASH DATE'
df['Year'] = df['CRASH DATE'].dt.year

# Group by 'Year' and 'BOROUGH' to get the count of crashes
crash_count_df = df.groupby(['Year', 'BOROUGH']).size().reset_index(name='Crash Count')
```

```
# Create a grouped bar chart
plt.figure(figsize=(12, 8))
colors = {'BROOKLYN': 'blue', 'QUEENS': 'green', 'MANHATTAN': 'red', 'BRONX': 'purple', 'STATEN ISLAND': 'ora

boroughs = df['BOROUGH'].unique()
width = 0.15  # Width of each bar

for i, borough in enumerate(boroughs):
    borough_data = crash_count_df[crash_count_df['BOROUGH'] == borough]
    positions = np.arange(len(borough_data['Year'])) + i * width
    plt.bar(positions, borough_data['Crash Count'], label=borough, color=colors[borough], width=width, alpha=

plt.title('Grouped Bar Chart of Yearly Crashes by Borough')
plt.xlabel('Year')
plt.ylabel('Crash Count')
plt.xticks(np.arange(len(crash_count_df['Year'].unique())) + 0.3, crash_count_df['Year'].unique())
plt.legend()
plt.show()
```

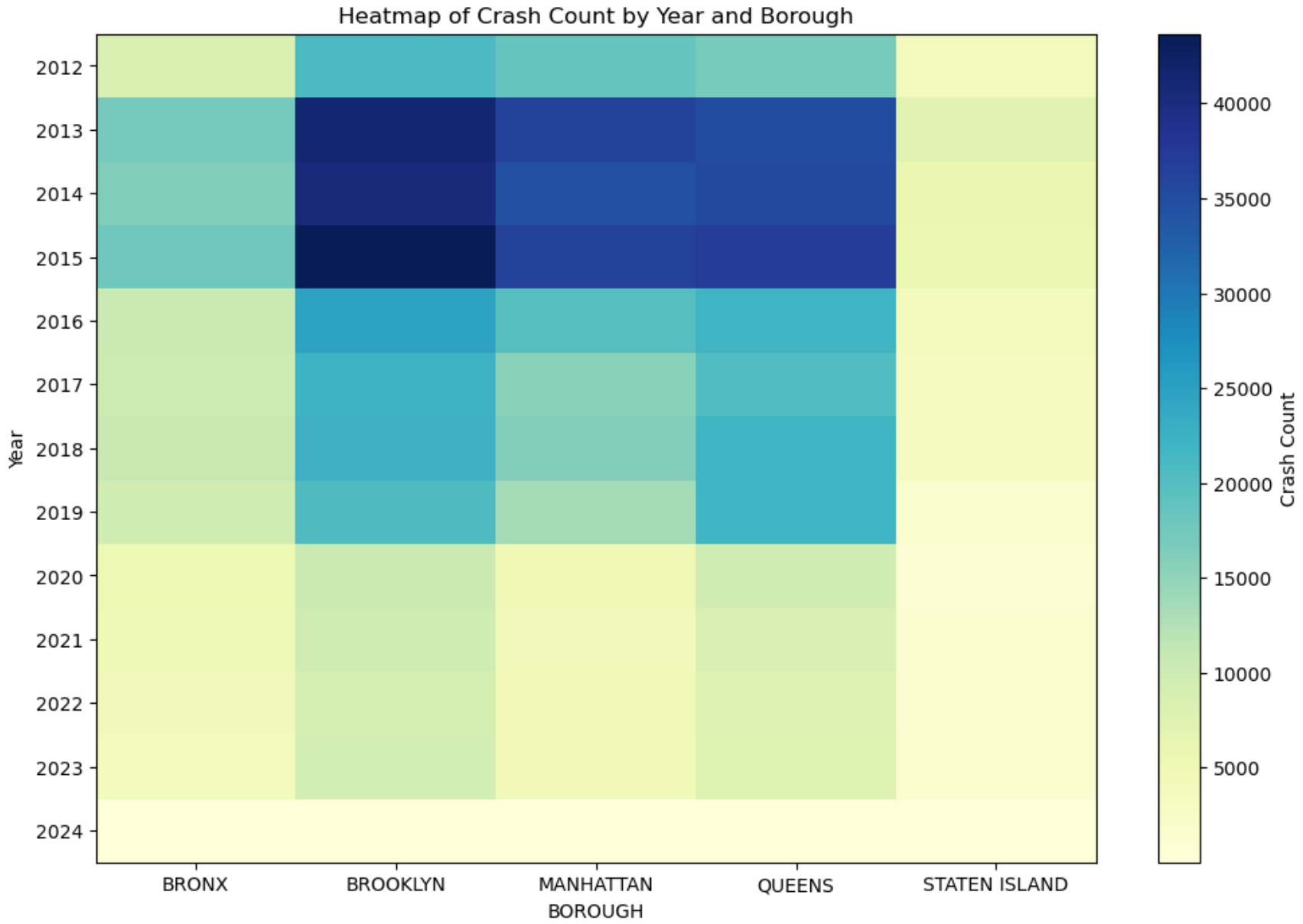
```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/366094321.py:6: DtypeWarning: Columns (2) ha
ve mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('normalized_typed_data.csv')  # Replace with your actual dataset file
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/366094321.py:9: UserWarning: The argument 'i
nfer_datetime_format' is deprecated and will be removed in a future version. A strict version of it is now th
e default, see https://pandas.pydata.org/pdeps/0004-consistent-to-datetime-parsing.html. You can safely remov
e this argument.
  df['CRASH DATE'] = pd.to_datetime(df['CRASH DATE'],  errors='coerce', infer_datetime_format=True)  # Adjust
the format if needed
```



In [13]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np

# Load your dataset
df = pd.read_csv('normalized_typed_data.csv')  # Replace with your actual dataset file

# Convert 'CRASH DATE' to datetime if not already done
```

```
df['CRASH DATE'] = pd.to_datetime(df['CRASH DATE'], errors='coerce', infer_datetime_format=True)  # Adjust th

# Extract year from 'CRASH DATE'
df['Year'] = df['CRASH DATE'].dt.year

# Group by 'Year' and 'BOROUGH' to get the count of crashes
crash_count_df = df.groupby(['Year', 'BOROUGH']).size().reset_index(name='Crash Count')

# Pivot the dataframe to have 'Year' as rows, 'BOROUGH' as columns, and 'Crash Count' as values
pivot_df = crash_count_df.pivot_table(index='Year', columns='BOROUGH', values='Crash Count', aggfunc='sum')

# Create a heatmap using matplotlib
plt.figure(figsize=(12, 8))
plt.imshow(pivot_df.values, cmap='YlGnBu', aspect='auto')

# Add labels and title
plt.xticks(np.arange(len(pivot_df.columns)), pivot_df.columns)
plt.yticks(np.arange(len(pivot_df.index)), pivot_df.index)
plt.xlabel('BOROUGH')
plt.ylabel('Year')
plt.title('Heatmap of Crash Count by Year and Borough')

# Add colorbar
plt.colorbar(label='Crash Count')

# Show the plot
plt.show()
```

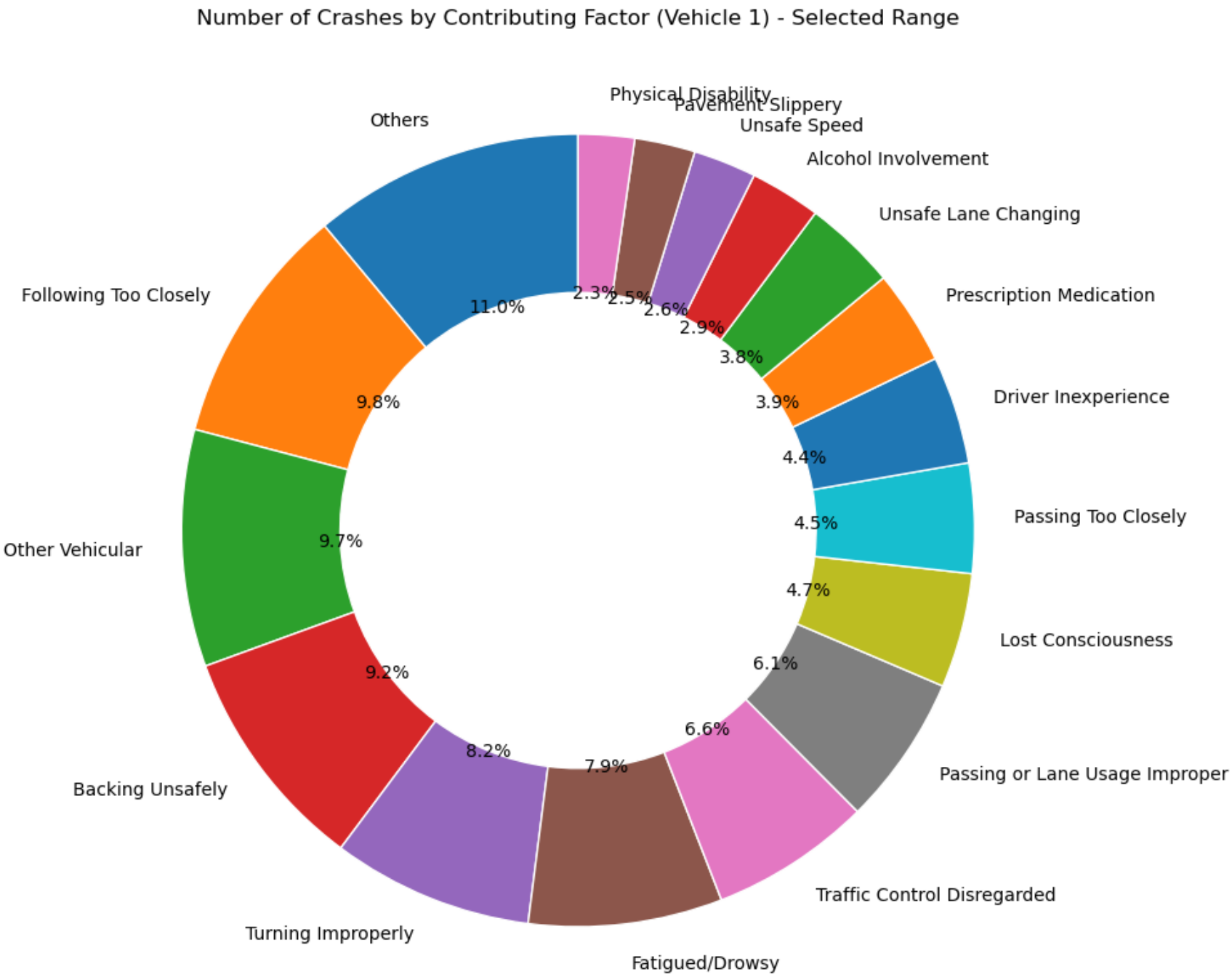
```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/2627463514.py:6: DtypeWarning: Columns (2) h
ave mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('normalized_typed_data.csv')  # Replace with your actual dataset file
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/2627463514.py:9: UserWarning: The argument
'infer_datetime_format' is deprecated and will be removed in a future version. A strict version of it is now
the default, see https://pandas.pydata.org/pdeps/0004-consistent-to-datetime-parsing.html. You can safely rem
ove this argument.
  df['CRASH DATE'] = pd.to_datetime(df['CRASH DATE'], errors='coerce', infer_datetime_format=True)  # Adjust
the format if needed
```



In [14]:
```
import matplotlib.pyplot as plt
import pandas as pd

# Load your dataset
df = pd.read_csv('normalized_typed_data.csv')  # Replace with your actual dataset file
```

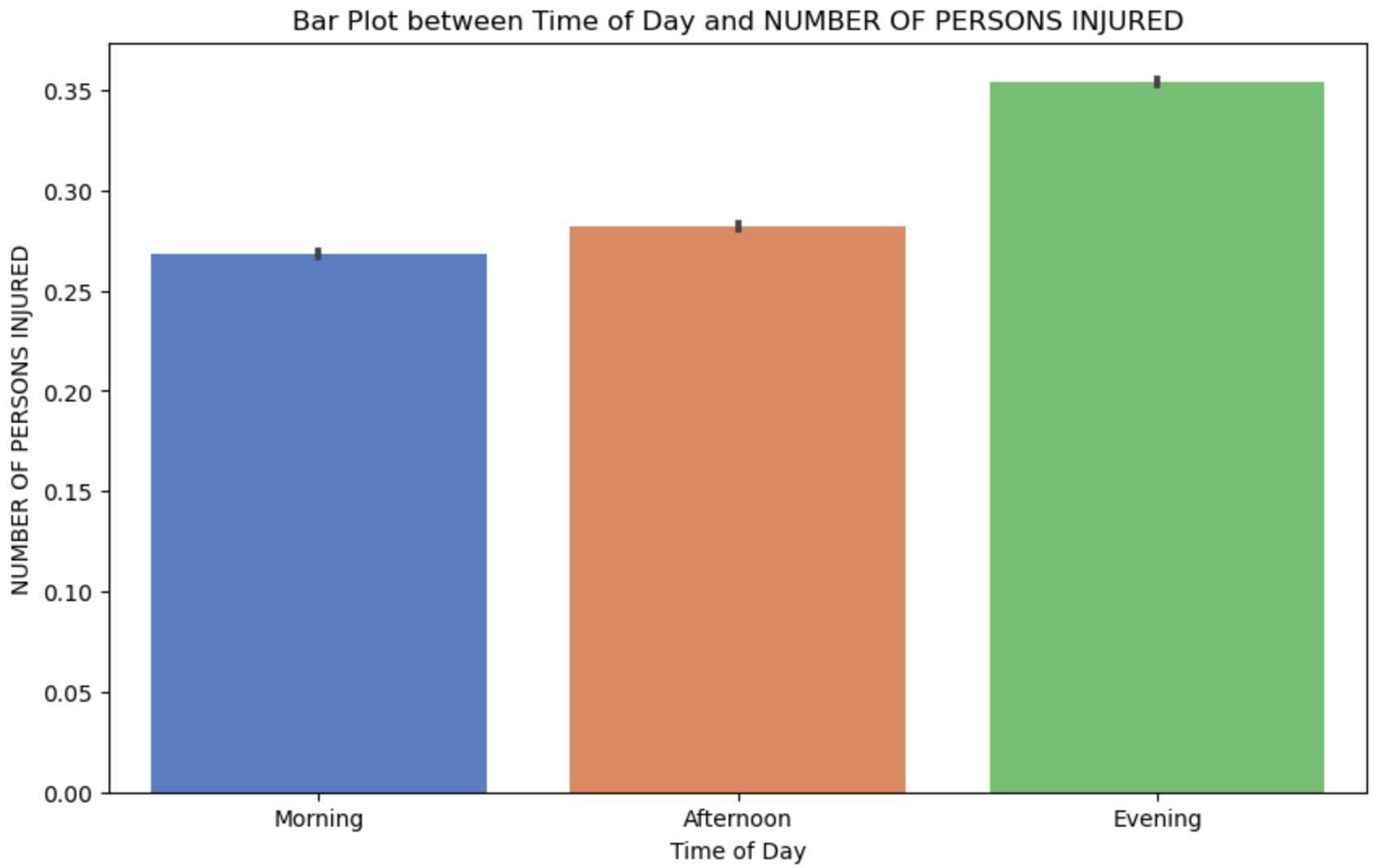
```
# Filter out rows where 'CONTRIBUTING FACTOR VEHICLE 1' is not available
df_filtered = df[df['CONTRIBUTING FACTOR VEHICLE 1'].notnull()]

# Group by 'CONTRIBUTING FACTOR VEHICLE 1' to get the count of crashes
factor_counts = df_filtered['CONTRIBUTING FACTOR VEHICLE 1'].value_counts()

# Filter factors within the specified range (more than 20,000 and less than 50,000)
selected_factors = factor_counts[(factor_counts > 2000) & (factor_counts < 50000)]

# Calculate the total number of crashes
total_crashes = selected_factors.sum()

# Calculate the percentage for each factor
factor_percentages = selected_factors / total_crashes * 100

# Combine factors with a percentage less than 1% into 'Others'
threshold = 2.1
others_mask = factor_percentages < threshold
others_sum = selected_factors[others_mask].sum()
others_list = selected_factors[others_mask].index.tolist()
selected_factors = selected_factors[~others_mask]
selected_factors['Others'] = others_sum

# Sort the selected factors by count in descending order
selected_factors = selected_factors.sort_values(ascending=False)

# Create a donut chart for selected factors
plt.figure(figsize=(10, 10))
plt.pie(selected_factors.values, labels=selected_factors.index, autopct='%1.1f%%', startangle=90,
        wedgeprops=dict(width=0.4, edgecolor='w'))  # Use wedgeprops to set the width and edge color
plt.title('Number of Crashes by Contributing Factor (Vehicle 1) - Selected Range')

# Display the list of factors included in 'Others' as a table
if isinstance(selected_factors['Others'], pd.Series) and not selected_factors['Others'].empty:
    others_df = pd.DataFrame({'Contributing Factor': ['Others'], 'Count': [selected_factors['Others']]})
    print("Factors included in 'Others':\n", others_df)
else:
    print("'Others' category is empty.")

plt.show()
```

```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/3916528058.py:5: DtypeWarning: Columns (2) h
ave mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('normalized_typed_data.csv')  # Replace with your actual dataset file
'Others' category is empty.
```


Number of Crashes by Contributing Factor (Vehicle 1) - Selected Range
Physical Disability
Pavement Slippery
Unsafe Speed
Alcohol Involvement
Unsafe Lane Changing
Prescription Medication
Driver Inexperience
Passing Too Closely
Lost Consciousness
Passing or Lane Usage Improper
Traffic Control Disregarded
Fatigued/Drowsy
Turning Improperly
Backing Unsafely
Other Vehicular
Following Too Closely
Others
2.3%
2.5%
2.6%
2.9%
3.8%
3.9%
4.4%
4.5%
4.7%
6.1%
6.6%
7.9%
8.2%
9.2%
9.7%
9.8%
11.0%

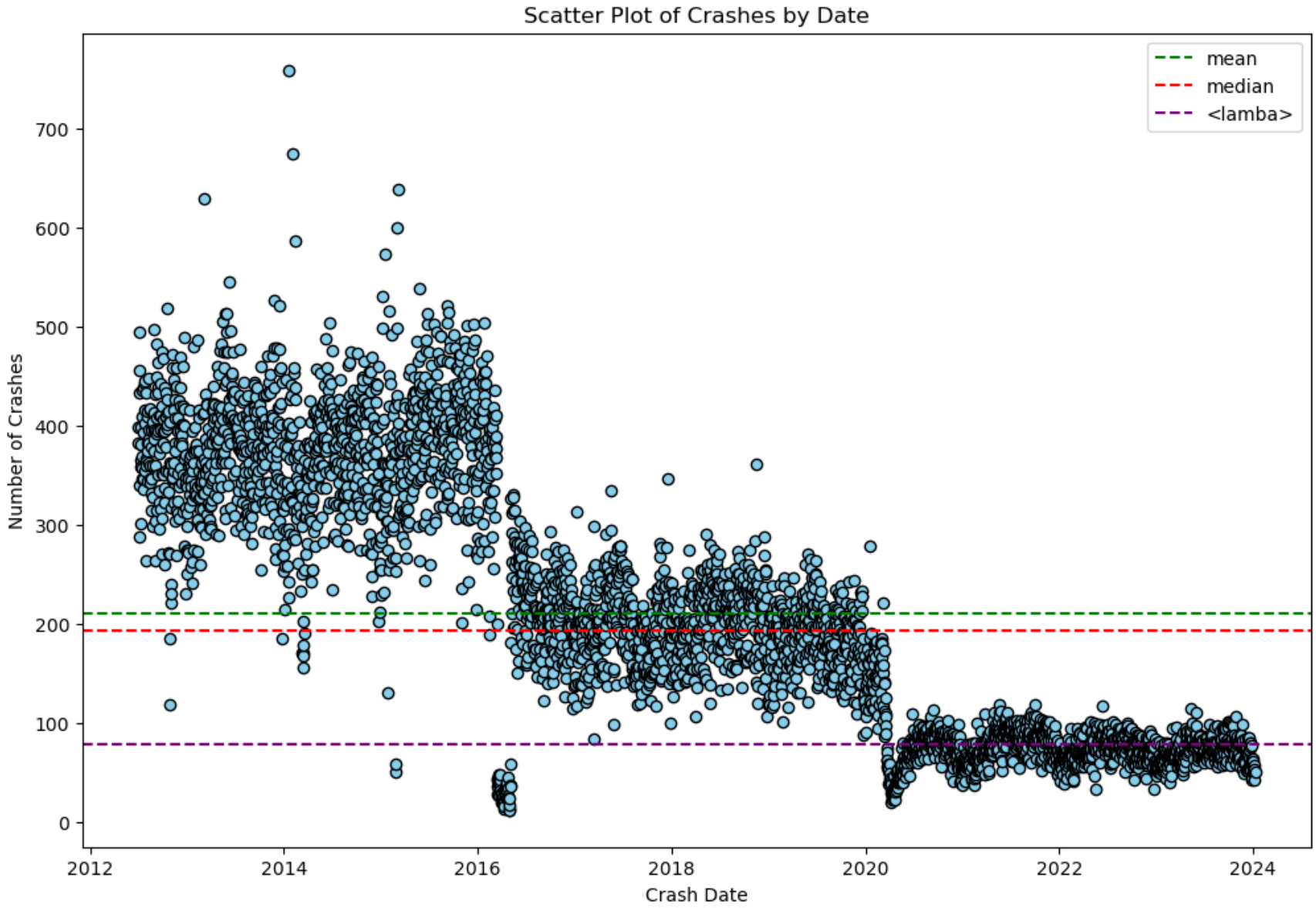
In [16]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Replace 'your_file.csv' with the actual path to your CSV file
file_path = 'Motor_Vehicle_Collisions_-_Crashes.csv'

# Replace 'CRASH TIME' and 'NUMBER OF PERSONS INJURED' with your actual column names
time_column = 'CRASH TIME'
injured_column = 'NUMBER OF PERSONS INJURED'

# Read the CSV file into a DataFrame
df = pd.read_csv(file_path)

# Filter out rows where 'CRASH TIME' is not in a valid datetime format
df[time_column] = pd.to_datetime(df[time_column], errors='coerce')

# Drop rows with missing or invalid datetime values
df = df.dropna(subset=[time_column])

# Extract hour from 'CRASH TIME' to create a new variable 'TIME OF DAY'
df['TIME OF DAY'] = df[time_column].dt.hour.apply(
    lambda x: 'Morning' if 5 <= x < 12 else ('Afternoon' if 12 <= x < 17 else 'Evening')
)

# Visualize the relationship using a bar plot
plt.figure(figsize=(10, 6))
sns.barplot(x='TIME OF DAY', y=injured_column, data=df, palette='muted', order=['Morning', 'Afternoon', 'Even
plt.title(f'Bar Plot between Time of Day and {injured_column}')
plt.xlabel('Time of Day')
plt.ylabel(injured_column)
plt.show()
```

```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/1622848669.py:13: DtypeWarning: Columns (3,
5,14,16) have mixed types. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv(file_path)
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/1622848669.py:16: UserWarning: Could not inf
er format, so each element will be parsed individually, falling back to `dateutil`. To ensure parsing is cons
istent and as-expected, please specify a format.
  df[time_column] = pd.to_datetime(df[time_column], errors='coerce')
```



In [17]:
```
import matplotlib.pyplot as plt
import pandas as pd

# Load your dataset
df = pd.read_csv('normalized_typed_data.csv', low_memory=False)  # Specify low_memory=False to suppress the w

# Convert 'CRASH DATE' to datetime if not already done
df['CRASH DATE'] = pd.to_datetime(df['CRASH DATE'], errors='coerce')  # Remove infer_datetime_format argument

# Group by 'CRASH DATE' to get the count of crashes
```

```
crash_count_df = df.groupby('CRASH DATE').size().reset_index(name='Crash Count')

# Calculate mean, median, and mode for the number of crashes
crash_stats = crash_count_df['Crash Count'].agg(['mean', 'median', lambda x: x.mode().values[0] if not x.mode
mean, median, mode = crash_stats['mean'], crash_stats['median'], crash_stats['<lambda>']

# Create a scatter plot
plt.figure(figsize=(12, 8))
plt.scatter(crash_count_df['CRASH DATE'], crash_count_df['Crash Count'], color='skyblue', edgecolor='black')
plt.axhline(y=mean, color='green', linestyle='--', label='mean')
plt.axhline(y=median, color='red', linestyle='--', label='median')
plt.axhline(y=mode, color='purple', linestyle='--', label='<lamba>')
plt.xlabel('Crash Date')
plt.ylabel('Number of Crashes')
plt.title('Scatter Plot of Crashes by Date')
plt.legend()
plt.show()

print("Mean:", mean)
print("Median:", median)
print("Mode:", mode)
```



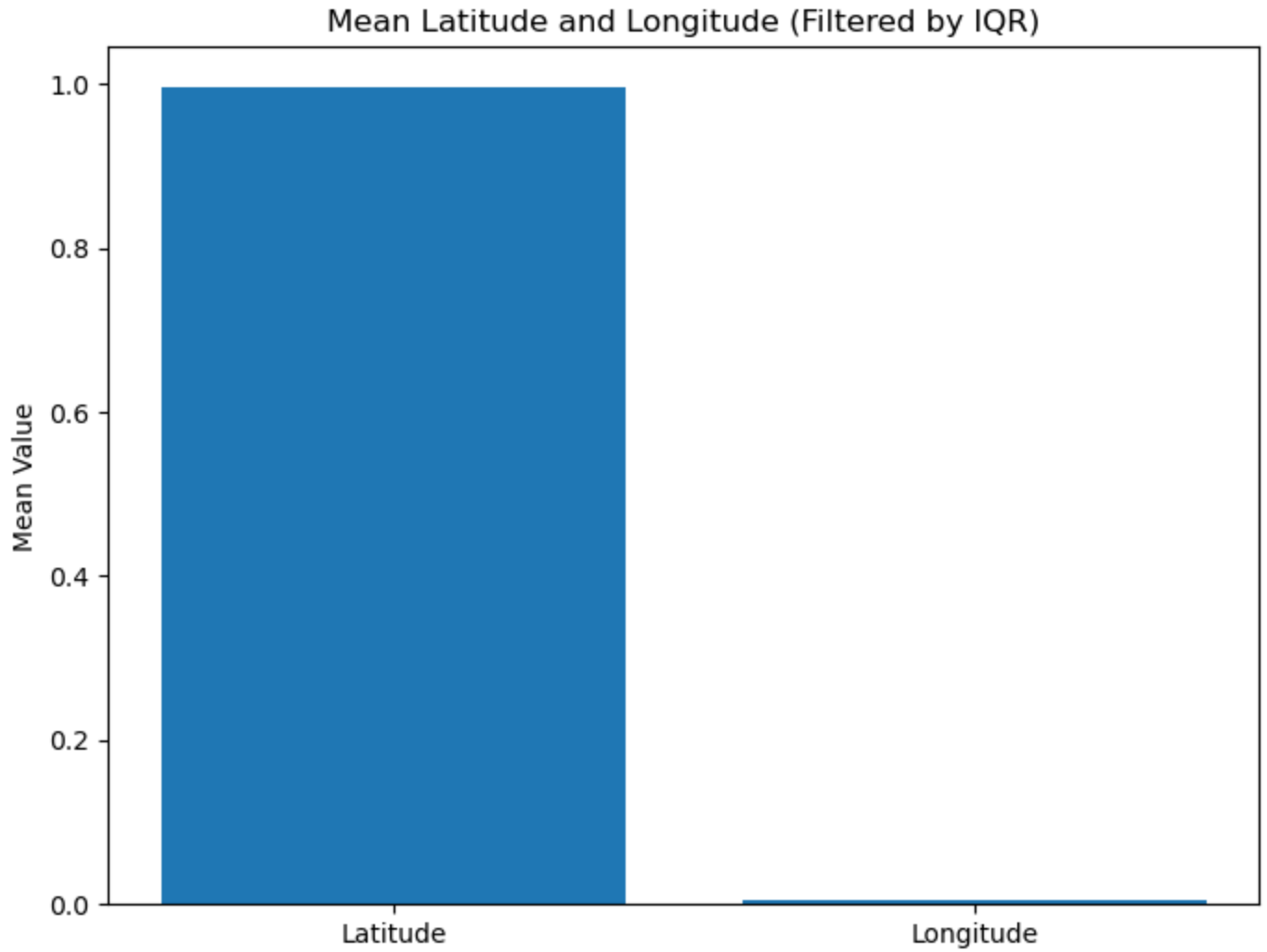

```
Mean: 210.58836104513065
Median: 193.0
Mode: 78.0
```

In [18]:
```
#IQR USING BAR PLOT
import pandas as pd
import matplotlib.pyplot as plt
```

```
def calculate_iqr(data, column_name):
    """
    Calculate the interquartile range (IQR) for a given column in a DataFrame.

    Parameters:
        data (DataFrame): The DataFrame containing the data.
        column_name (str): The name of the column for which to calculate the IQR.

    Returns:
        float: The interquartile range (IQR) for the specified column.
    """
    # Select the specified column
    column_data = data[column_name]

    # Calculate the first quartile (Q1)
    q1 = column_data.quantile(0.25)

    # Calculate the third quartile (Q3)
    q3 = column_data.quantile(0.75)

    # Calculate the interquartile range (IQR)
    iqr = q3 - q1

    return iqr

# Load the dataset (replace 'your_data.csv' with the actual file path)
data = pd.read_csv('normalized_typed_data.csv')

# Choose the columns for analysis
column1_name = 'LATITUDE'
column2_name = 'LONGITUDE'

# Calculate the interquartile range (IQR) for the selected columns
iqr_column1 = calculate_iqr(data, column1_name)
iqr_column2 = calculate_iqr(data, column2_name)

# Filter out outliers based on IQR
filtered_data = data[(data[column1_name] >= data[column1_name].quantile(0.25) - 1.5 * iqr_column1) &
                     (data[column1_name] <= data[column1_name].quantile(0.75) + 1.5 * iqr_column1) &
                     (data[column2_name] >= data[column2_name].quantile(0.25) - 1.5 * iqr_column2) &
                     (data[column2_name] <= data[column2_name].quantile(0.75) + 1.5 * iqr_column2)]

# Calculate mean latitude and mean longitude
mean_latitude = filtered_data[column1_name].mean()
mean_longitude = filtered_data[column2_name].mean()
```

```
# Create a bar plot with mean latitude and mean longitude
plt.figure(figsize=(8, 6))
plt.bar(['Latitude', 'Longitude'], [mean_latitude, mean_longitude])
plt.title('Mean Latitude and Longitude (Filtered by IQR)')
plt.ylabel('Mean Value')
plt.show()
```

```
/var/folders/sw/ydpk7dx52cbd5q0j4xt5kc_r0000gn/T/ipykernel_16612/1033470373.py:31: DtypeWarning: Columns (2)
have mixed types. Specify dtype option on import or set low_memory=False.
  data = pd.read_csv('normalized_typed_data.csv')
```



In [ ]:

In [ ]: