P9: Demonstrate the use of “Matplotlib” modules to plot line and scatter plot

1. Import the domain dataset that you identiied and use it as a data source for below mentioned questions.
2. Demonstrate the below-mentioned basic plots using ‘matplotlib’ library Histogram, Scatorplot, Line plot, Bargraph, Pie Chart, Area plot, Box plot, and pair plot.
3. Draw any two advanced graphs by referring to the mentioned link below. https://matplotlib.org/stable/gallery/index.html

In [ ]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
import seaborn as sns


df = pd.read_csv('./Parking.csv')
print(df.head(10))
print(df.info())
print(df.shape)
print(df.describe())
```

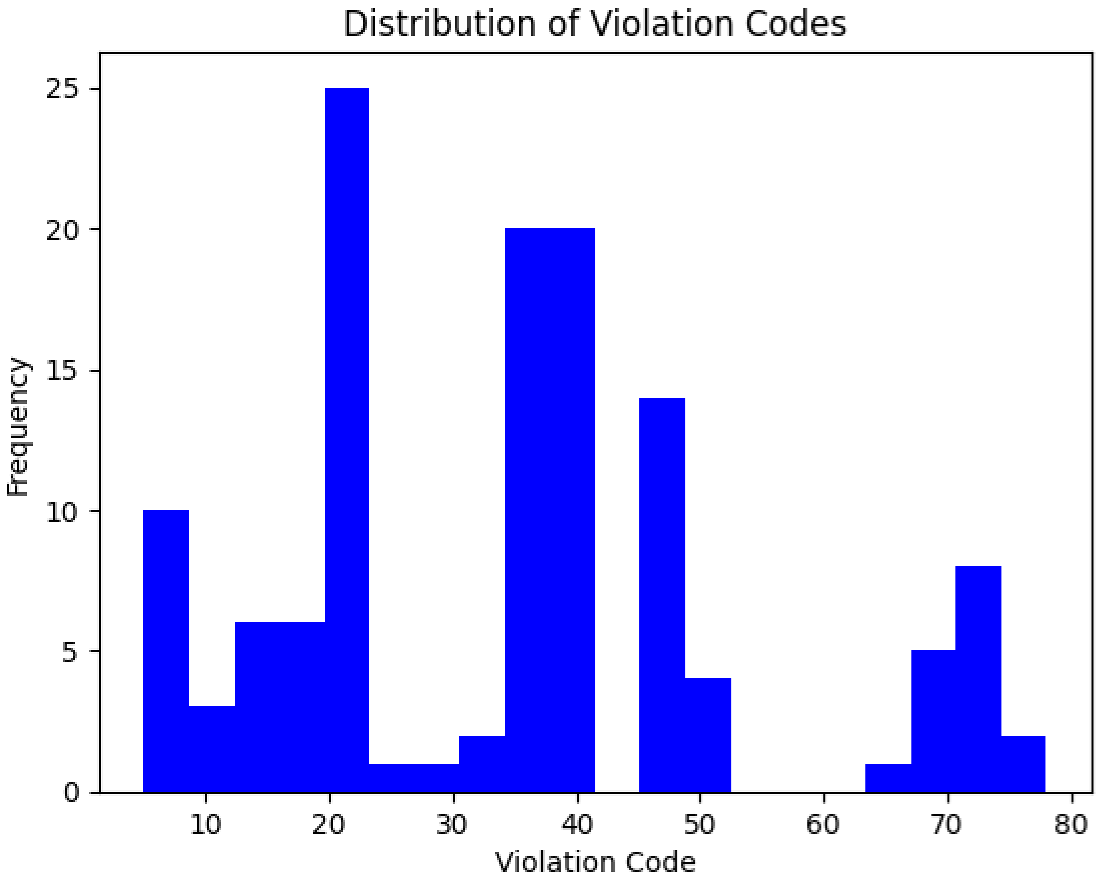
```
   Summons Number Plate ID Registration State Plate Type  Issue Date  
0      5092469481  GZH7067                 NY        PAS   7/10/2016   \
1      5092451658  GZH7067                 NY        PAS    7/8/2016   
2      4006265037  FZX9232                 NY        PAS   8/23/2016   
3      8478629828  66623ME                 NY        COM   6/14/2017   
4      7868300310  37033JV                 NY        COM  11/21/2016   
5      5096917368  FZD8593                 NY        PAS   6/13/2017   
6      1413609545   X20DCM                 NJ        PAS    8/3/2016   
7      4628525523   326SF9                 MA        PAS  12/21/2016   
8      4627113330  HCA5464                 NY        OMS  11/21/2016   
9      4006478550  VAD7274                 VA        PAS   10/5/2016   

   Violation Code Vehicle Body Type Vehicle Make Issuing Agency  Street Code1  
0               7              SUBN        TOYOT              V           NaN  
1               7              SUBN        TOYOT              V           NaN  
2               5              SUBN         FORD              V           NaN  
3              47              REFG        MITSU              T         161.0  
4              69              DELV        INTER              T         151.0  
5               7              SUBN        ME/BE              V           NaN  
6              40               SDN        TOYOT              P         547.0  
7              36                UT          BMW              V           NaN  
8              36              SUBN        DODGE              V           NaN  
9               5                4D          BMW              V           NaN  
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 128 entries, 0 to 127
Data columns (total 10 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   Summons Number      128 non-null    int64  
 1   Plate ID            128 non-null    object 
 2   Registration State  128 non-null    object 
 3   Plate Type          128 non-null    object 
 4   Issue Date          128 non-null    object 
 5   Violation Code      128 non-null    int64  
 6   Vehicle Body Type   128 non-null    object 
 7   Vehicle Make        128 non-null    object 
 8   Issuing Agency      128 non-null    object 
 9   Street Code1        98 non-null     float64
dtypes: float64(1), int64(2), object(7)
memory usage: 10.1+ KB
None
(128, 10)
       Summons Number  Violation Code  Street Code1
count    1.280000e+02      128.000000     98.000000
mean     6.806207e+09       34.328125   2450.979592
std      2.362242e+09       18.551104   2427.015120
min      1.400876e+09        5.000000     19.000000
25%      5.092465e+09       20.000000    630.500000
50%      8.124282e+09       36.000000   1777.000000
75%      8.482552e+09       46.000000   3450.500000
max      8.581154e+09       78.000000  16135.000000
```

Histogram

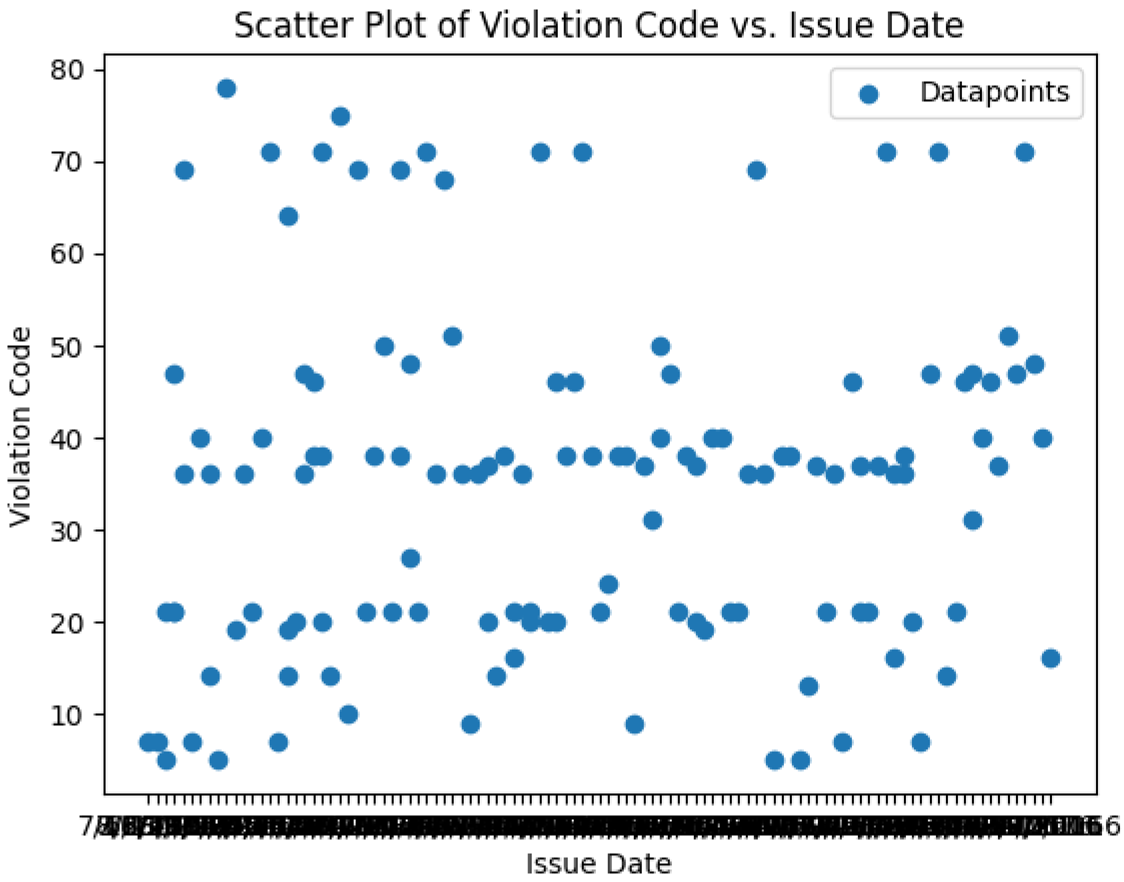
In [ ]:

```
plt.hist(df['Violation Code'], bins=20, color='blue', alpha=1.0)
plt.xlabel('Violation Code')
plt.ylabel('Frequency')
plt.title('Distribution of Violation Codes')
plt.show()
```



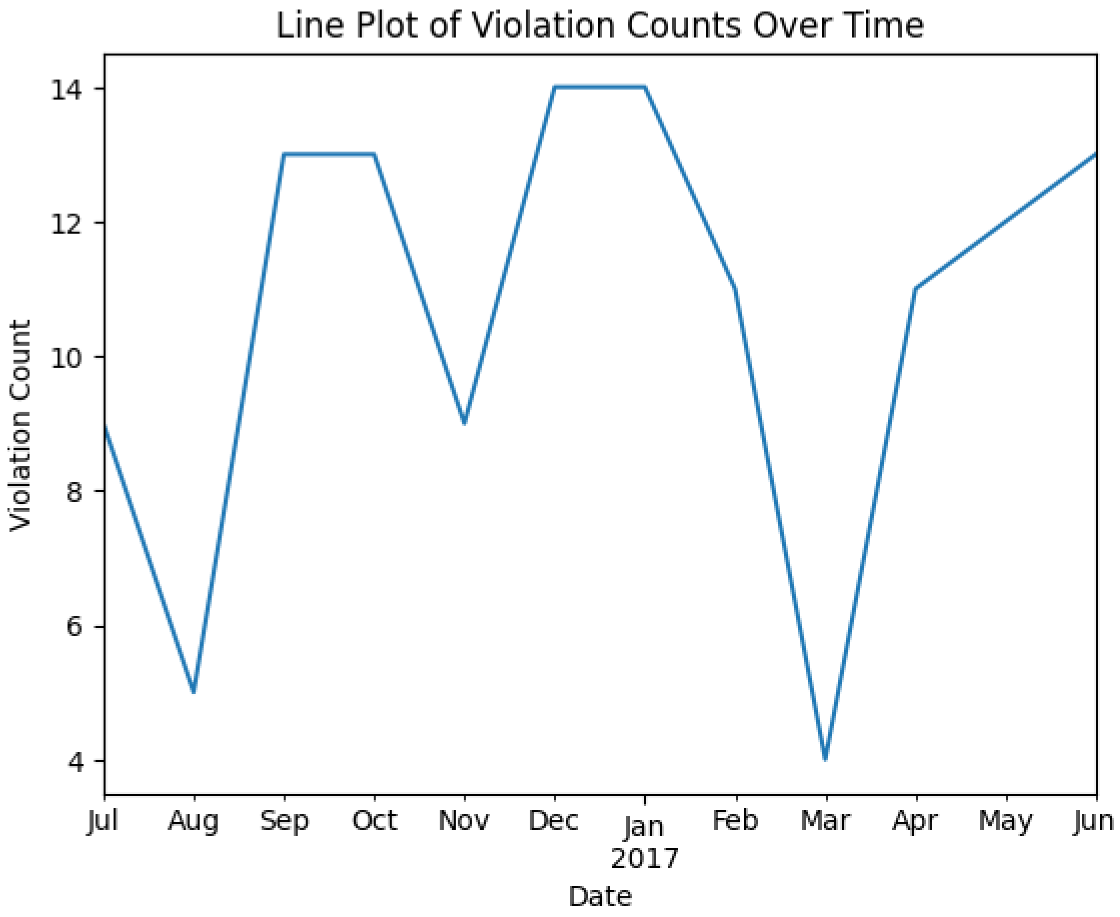
Scatter Plot

```
In [ ]: plt.scatter(df['Issue Date'], df['Violation Code'], label="Datapoints", alpha=1.0)
        plt.xlabel('Issue Date')
        plt.ylabel('Violation Code')
        plt.title('Scatter Plot of Violation Code vs. Issue Date')
        plt.legend()
        plt.show()
```



Line Plot

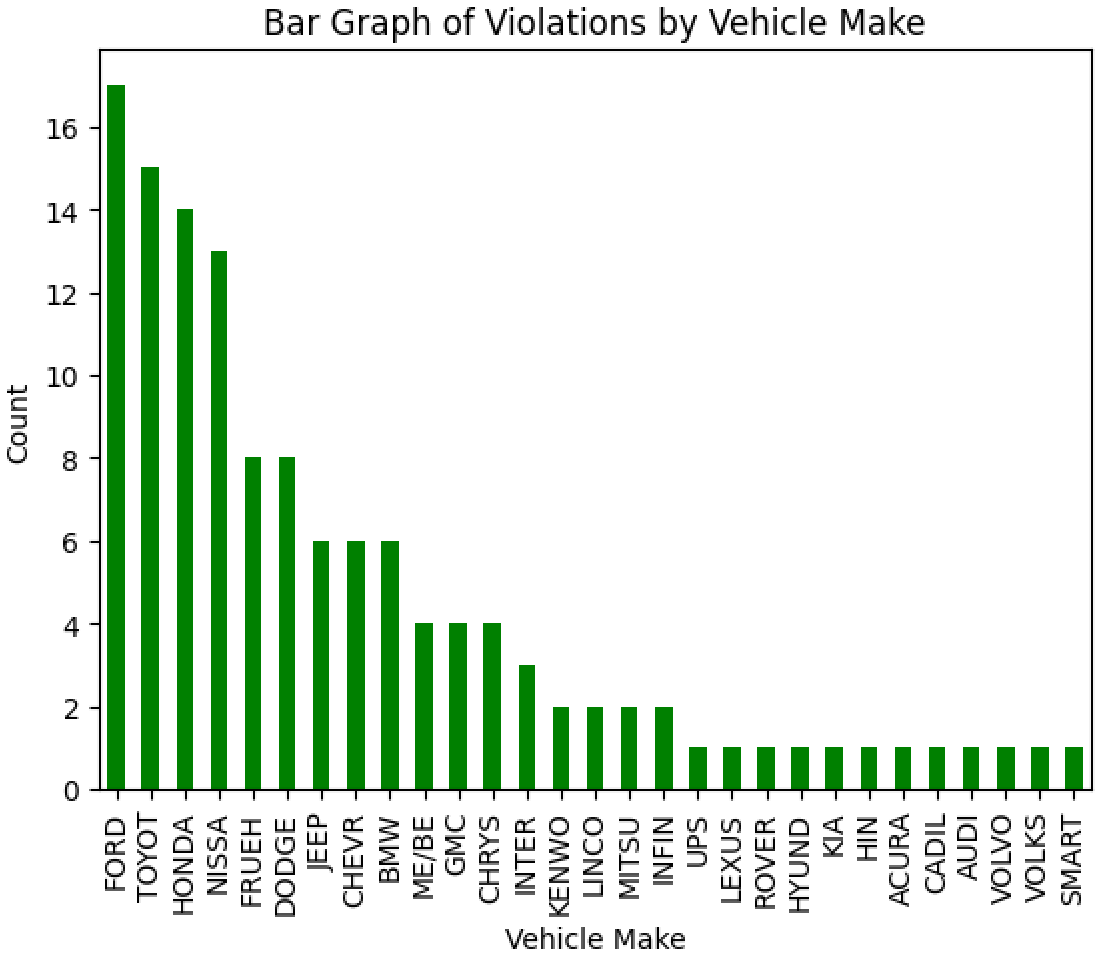
```
In [ ]: df['Issue Date'] = pd.to_datetime(df['Issue Date'])
        df.set_index('Issue Date')['Violation Code'].resample('M').count().plot()
        plt.xlabel('Date')
        plt.ylabel('Violation Count')
        plt.title('Line Plot of Violation Counts Over Time')
        plt.show()
```



Bar Graph

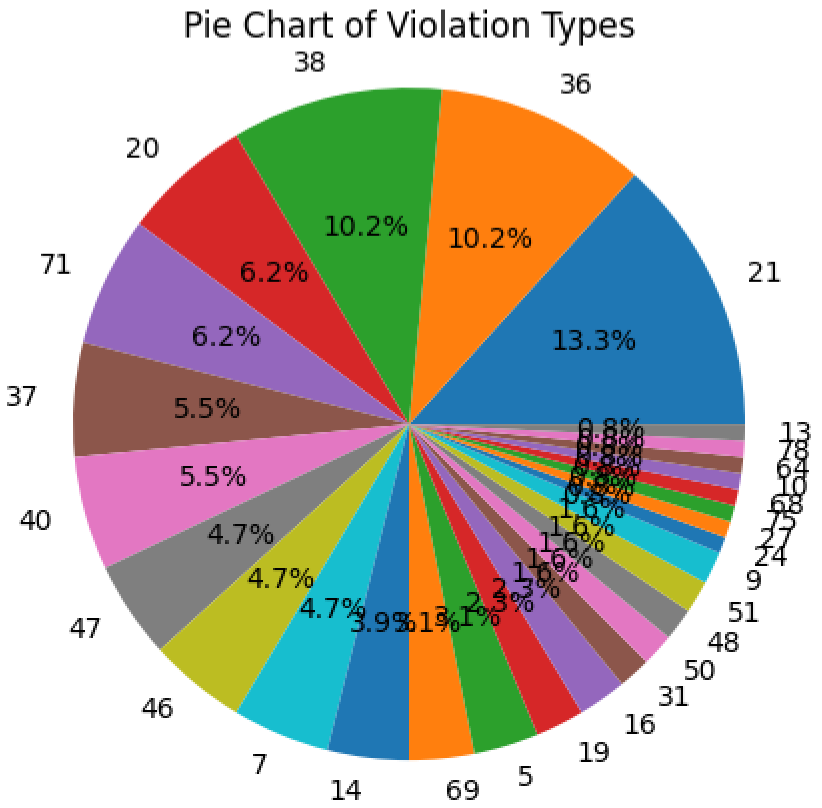
In [ ]:

```
violation_counts_by_make = df['Vehicle Make'].value_counts()
violation_counts_by_make.plot(kind='bar', color='green')
plt.xlabel('Vehicle Make')
plt.ylabel('Count')
plt.title('Bar Graph of Violations by Vehicle Make')
plt.xticks(rotation=90)
plt.show()
```



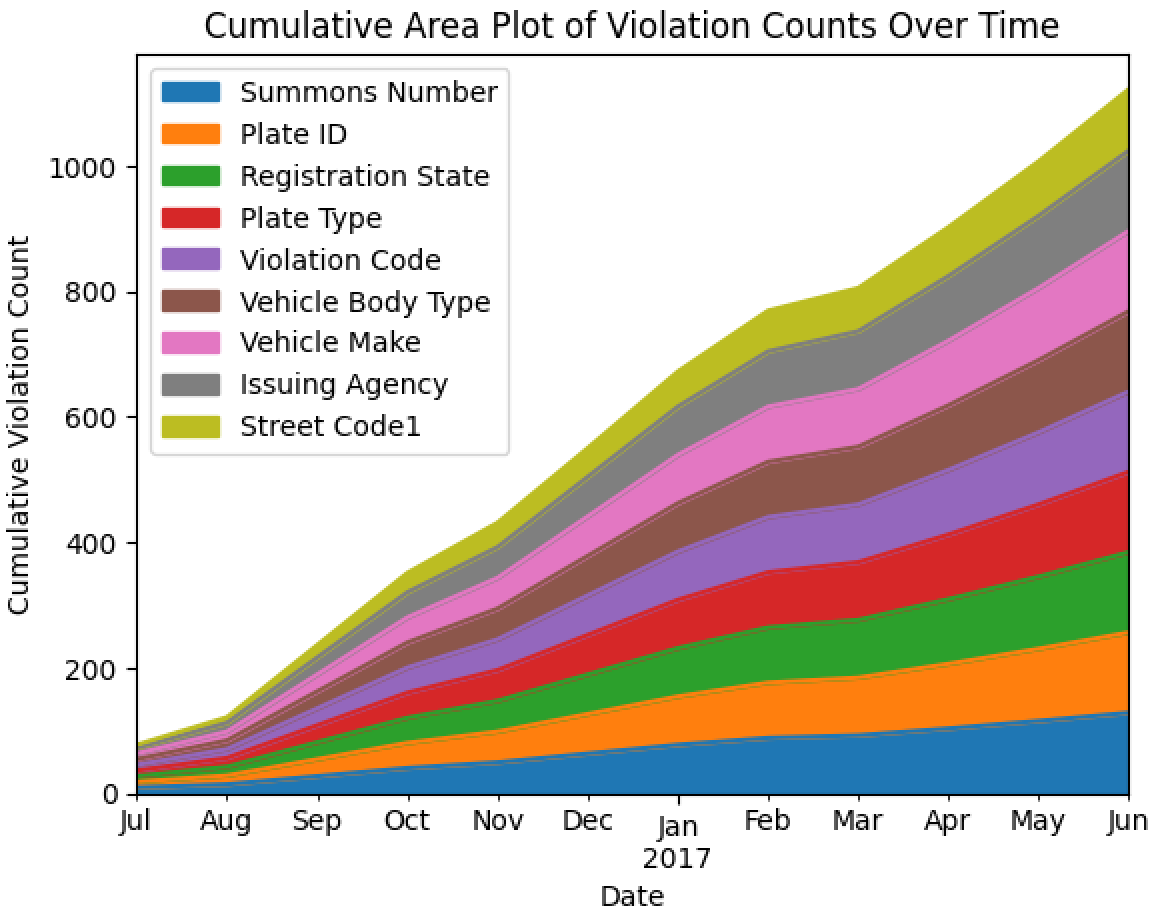
Pie Chart

```
In [ ]: violation_type_counts = df['Violation Code'].value_counts()
        plt.pie(violation_type_counts, labels=violation_type_counts.index, autopct='%1.1f%%
        plt.title('Pie Chart of Violation Types')
        plt.axis('equal')
        plt.show()
```



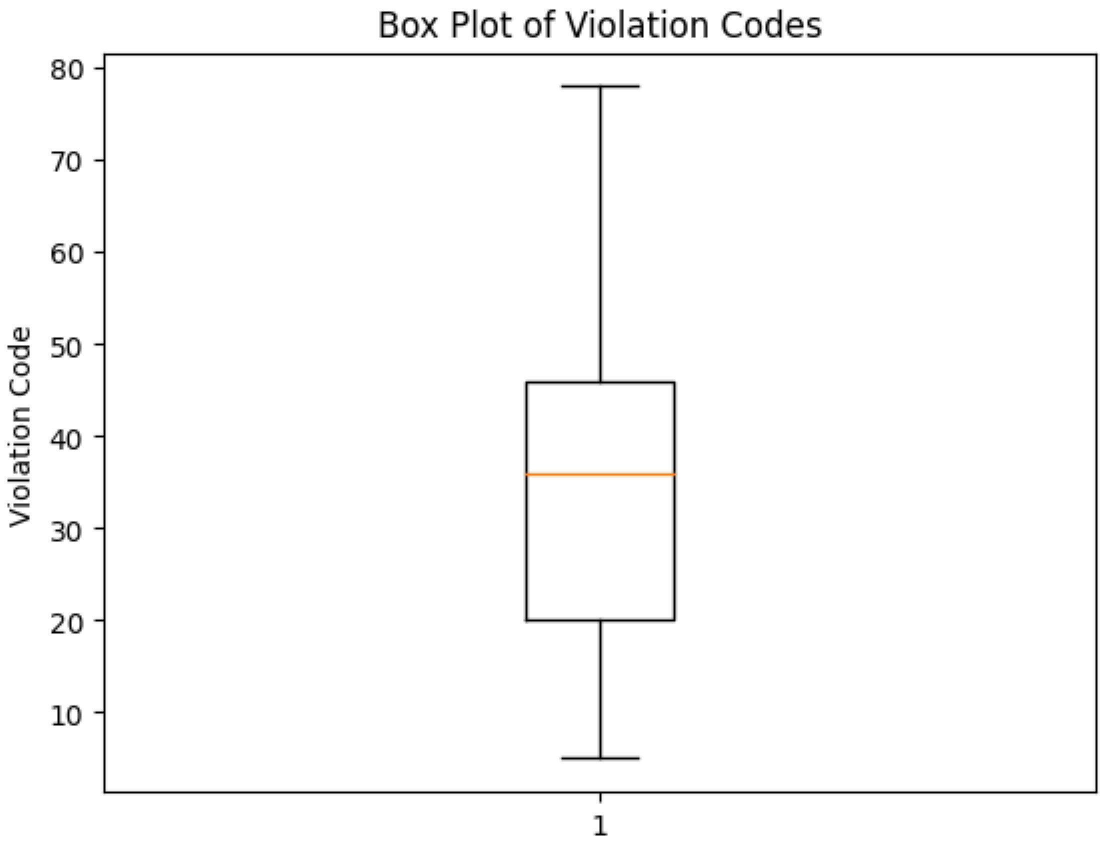
Area Plot

```
In [ ]: df.set_index('Issue Date').resample('M').count().cumsum().plot(kind='area')
        plt.xlabel('Date')
        plt.ylabel('Cumulative Violation Count')
        plt.title('Cumulative Area Plot of Violation Counts Over Time')
        plt.show()
```



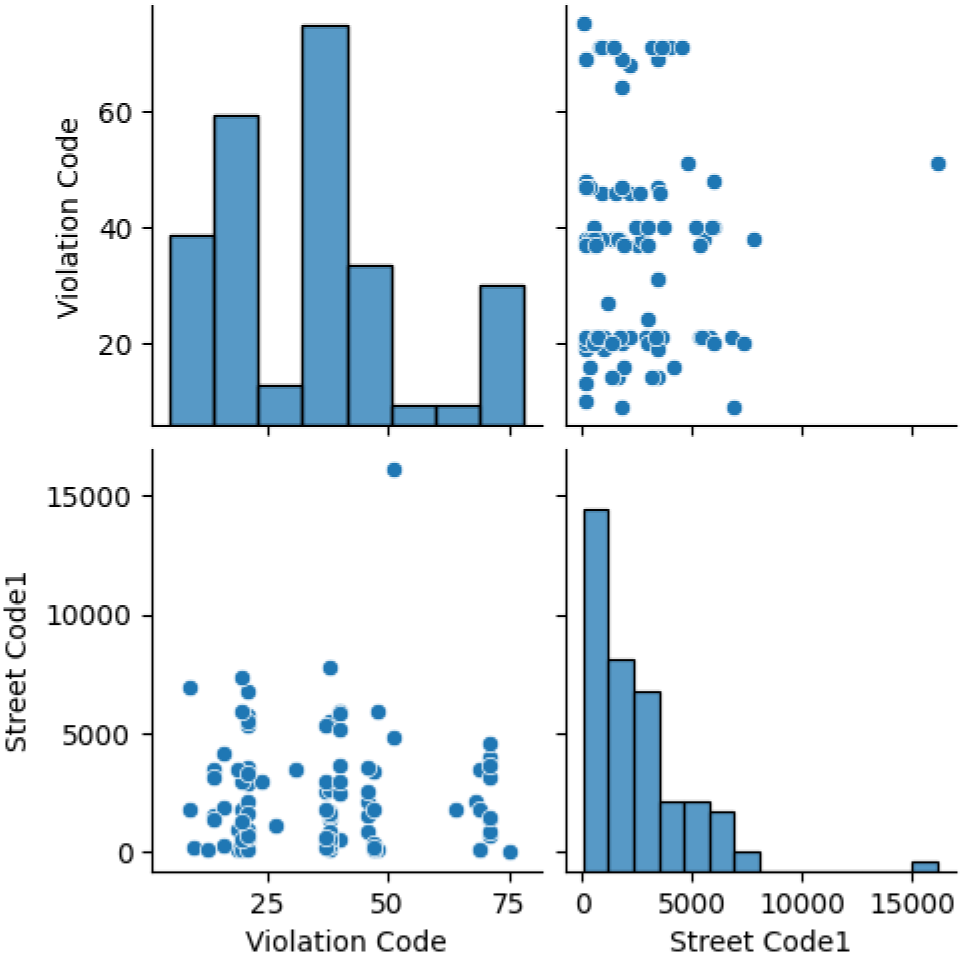
Box Plot

```
In [ ]: plt.boxplot(df['Violation Code'])
        plt.ylabel('Violation Code')
        plt.title('Box Plot of Violation Codes')
        plt.show()
```



Pair Plot

```
In [ ]: sns.pairplot(df[['Violation Code', 'Street Code1', 'Issue Date']])
        plt.show()
```



3D Surface Plot

In [ ]:

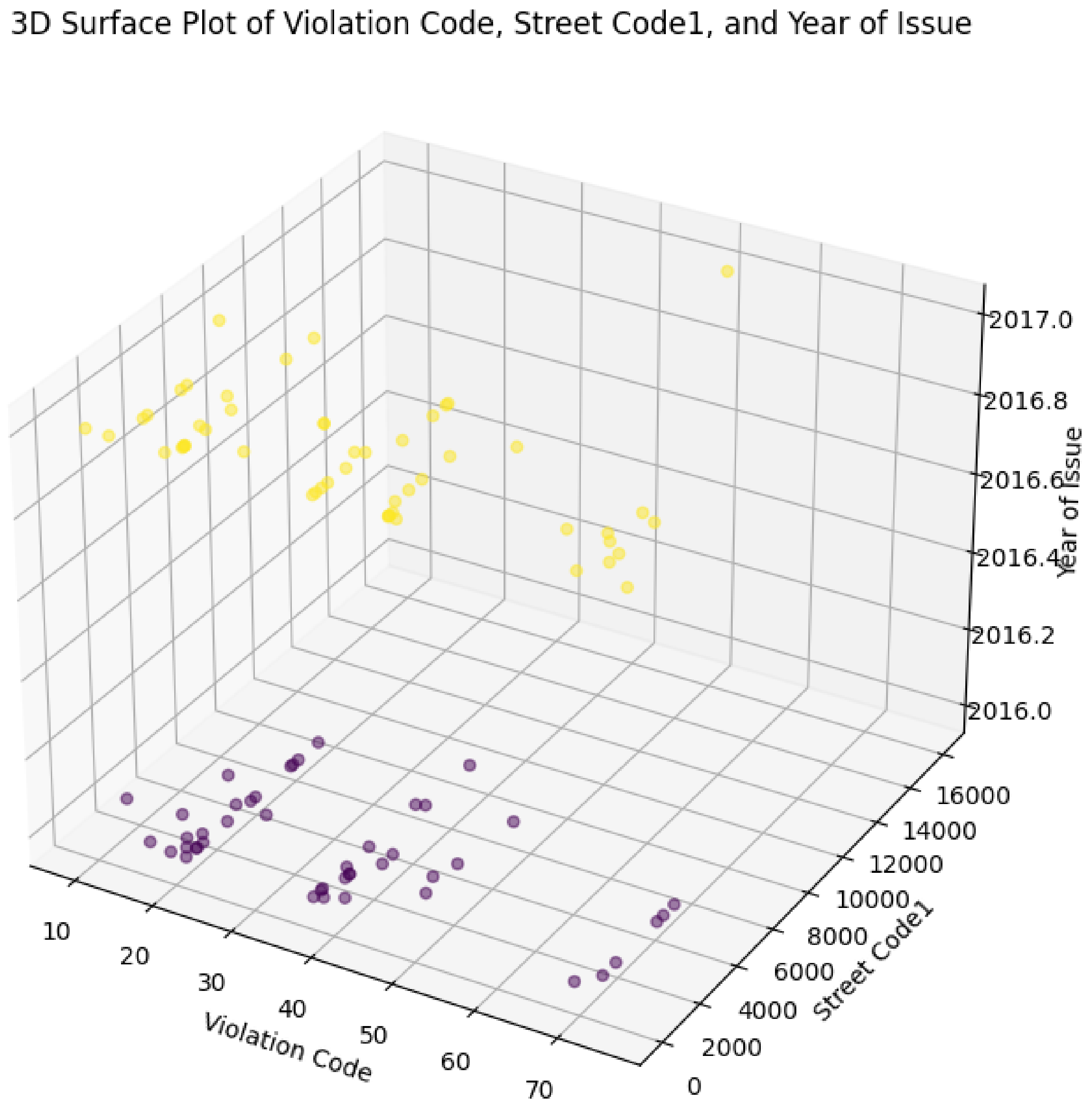
```
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D

df = pd.read_csv('./Parking.csv')

x = df['Violation Code']
y = df['Street Code1']
z = df['Issue Date'].str.split('/').str[2].astype(int)

fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot(111, projection='3d')

ax.scatter(x, y, z, c=z, cmap='viridis', marker='o', alpha=0.5)
ax.set_xlabel('Violation Code')
ax.set_ylabel('Street Code1')
ax.set_zlabel('Year of Issue')
ax.set_title('3D Surface Plot of Violation Code, Street Code1, and Year of Issue')
plt.show()
```

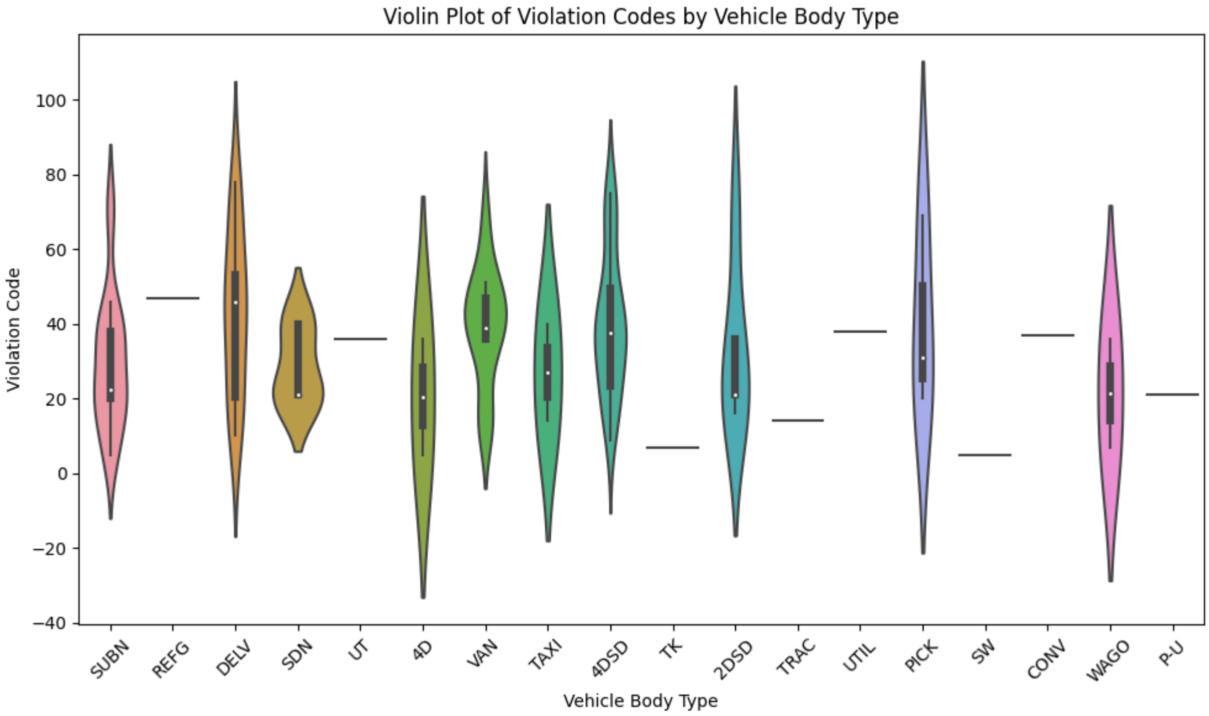


Violin Plot

In [ ]:

```python
plt.figure(figsize=(10, 6))
sns.violinplot(x='Vehicle Body Type', y='Violation Code', data=df)
plt.xlabel('Vehicle Body Type')
plt.ylabel('Violation Code')
plt.title('Violin Plot of Violation Codes by Vehicle Body Type')
plt.xticks(rotation=45)

plt.tight_layout()
plt.show()
```


Violin Plot of Violation Codes by Vehicle Body Type
Violation Code
100
80
60
40
20
0
−20
−40
SUBN
REFG
DELV
SDN
UT
4D
VAN
TAXI
4DSD
TK
2DSD
TRAC
UTIL
PICK
SW
CONV
WAGO
P-U
Vehicle Body Type