us_crime_data_exploration

November 24, 2023

1 Exploratory Analysis of Crime Patterns in the USA (June 2015 - September 2018)

Crime analysis plays a crucial role in understanding patterns, trends, and factors influencing criminal activities within a specific region and timeframe. In this project, we delve into a dataset containing crime incidents in the USA from June 2015 to September 2018. By utilizing Python, pandas, matplotlib, and seaborn, we aim to uncover insightful information about the nature of these crimes, their distribution across various parameters, and trends that could aid law enforcement agencies and policymakers in crime prevention strategies.

1.1 Introduction

Crime is a complex and multifaceted social phenomenon that requires a comprehensive approach for effective analysis. This project focuses on analyzing a dataset encompassing crime incidents spanning three years in the USA. The dataset contains information such as offense type, location, date, and other relevant attributes. By applying data analysis techniques, we aim to shed light on various aspects of these crimes, helping us understand patterns and trends that may inform crime mitigation strategies.

1.1.1 Methods

```
Data Preprocessing: Load the dataset using pandas, clean and format data, handle missing values

Exploratory Data Analysis (EDA):
    Most Common Offense Group: Identify the most frequent crime types by grouping offenses.
    Top Ten Crimes in Offense Group: Visualize the top ten specific crimes within the most comm
    Least Common Offense Group: Identify and explore the least common offense group.
    Year-wise Crime Distribution: Analyze crime distribution across years to identify trends.
    Day-wise Crime Distribution: Examine crime occurrence patterns across days of the week.
    Hour-wise Crime Distribution: Explore patterns of crime occurrence throughout the day.
    Day and Hour-wise Heatmap: Create a heatmap of crimes based on days and hours.
```

Import necessary libraries

[ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
```

```python
from encodings.aliases import aliases
```

1.2 Read CSV file and Cleaning the data

Set up correct encoding for the dataset

[ ]:
```python
alias_values = set(aliases.values())

for encoding in set(aliases.values()):
    try:
        df = pd.read_csv('crime.csv', nrows= 10, encoding= encoding)
        print('sucessful', encoding)
    except:
        pass
```

```
sucessful iso8859_8
sucessful cp775
sucessful cp1257
sucessful gbk
sucessful cp860
sucessful cp1251
sucessful iso8859_14
sucessful cp1258
sucessful cp857
sucessful cp437
sucessful cp932
sucessful iso8859_13
sucessful kz1048
sucessful mac_latin2
sucessful cp1253
sucessful iso8859_15
sucessful cp1140
sucessful cp037
sucessful iso8859_5
sucessful cp949
sucessful utf_16_be
sucessful cp500
sucessful cp858
sucessful cp864
sucessful iso8859_10
sucessful mac_turkish
sucessful iso8859_2
sucessful iso8859_11
sucessful cp869
sucessful koi8_r
sucessful iso8859_7
sucessful ptcp154
sucessful cp1256
```

```
sucessful cp273
sucessful utf_16_le
sucessful cp866
sucessful iso8859_3
sucessful iso8859_4
sucessful mac_cyrillic
sucessful iso8859_6
sucessful iso8859_16
sucessful cp1254
sucessful cp863
sucessful mac_greek
sucessful cp850
sucessful cp1252
sucessful cp1255
sucessful big5hkscs
sucessful cp1250
sucessful hp_roman8
sucessful cp1026
sucessful iso8859_9
sucessful gb18030
sucessful cp855
sucessful cp1125
sucessful mac_roman
sucessful cp862
sucessful cp861
sucessful cp865
sucessful mac_iceland
sucessful cp852
sucessful latin_1
```

Read the dataset

[ ]:
```
crime = pd.read_csv('crime.csv', encoding='ISO-8859-11').squeeze()
crime.head(10)
```

[ ]:
```
  INCIDENT_NUMBER  OFFENSE_CODE                 OFFENSE_CODE_GROUP  \
0      I182070945           619                            Larceny
1      I182070943          1402                          Vandalism
2      I182070941          3410                              Towed
3      I182070940          3114               Investigate Property
4      I182070938          3114               Investigate Property
5      I182070936          3820  Motor Vehicle Accident Response
6      I182070933           724                         Auto Theft
7      I182070932          3301                    Verbal Disputes
8      I182070931           301                            Robbery
9      I182070929          3301                    Verbal Disputes

                      OFFENSE_DESCRIPTION DISTRICT REPORTING_AREA  \
```

```
0                        LARCENY ALL OTHERS      D14            808
1                                 VANDALISM      C11            347
2                       TOWED MOTOR VEHICLE       D4            151
3                      INVESTIGATE PROPERTY       D4            272
4                      INVESTIGATE PROPERTY       B3            421
5  M/V ACCIDENT INVOLVING PEDESTRIAN - INJURY      C11            398
6                                AUTO THEFT       B2            330
7                            VERBAL DISPUTE       B2            584
8                          ROBBERY - STREET       C6            177
9                            VERBAL DISPUTE      C11            364

  SHOOTING     OCCURRED_ON_DATE  YEAR  MONTH DAY_OF_WEEK  HOUR    UCR_PART  \
0      NaN  2018-09-02 13:00:00  2018      9      Sunday    13    Part One
1      NaN  2018-08-21 00:00:00  2018      8     Tuesday     0    Part Two
2      NaN  2018-09-03 19:27:00  2018      9      Monday    19  Part Three
3      NaN  2018-09-03 21:16:00  2018      9      Monday    21  Part Three
4      NaN  2018-09-03 21:05:00  2018      9      Monday    21  Part Three
5      NaN  2018-09-03 21:09:00  2018      9      Monday    21  Part Three
6      NaN  2018-09-03 21:25:00  2018      9      Monday    21    Part One
7      NaN  2018-09-03 20:39:37  2018      9      Monday    20  Part Three
8      NaN  2018-09-03 20:48:00  2018      9      Monday    20    Part One
9      NaN  2018-09-03 20:38:00  2018      9      Monday    20  Part Three

             STREET        Lat       Long                     Location
0        LINCOLN ST  42.357791 -71.139371  (42.35779134, -71.13937053)
1          HECLA ST  42.306821 -71.060300  (42.30682138, -71.06030035)
2       CAZENOVE ST  42.346589 -71.072429  (42.34658879, -71.07242943)
3        NEWCOMB ST  42.334182 -71.078664  (42.33418175, -71.07866441)
4          DELHI ST  42.275365 -71.090361  (42.27536542, -71.09036101)
5        TALBOT AVE  42.290196 -71.071590  (42.29019621, -71.07159012)
6       NORMANDY ST  42.306072 -71.082733  (42.30607218, -71.08273260)
7           LAWN ST  42.327016 -71.105551  (42.32701648, -71.10555088)
8  MASSACHUSETTS AVE  42.331521 -71.070853  (42.33152148, -71.07085307)
9         LESLIE ST  42.295147 -71.058608  (42.29514664, -71.05860832)
```

[ ]:
```
crime.shape
```

[ ]: (319073, 17)

[ ]:
```
crime.duplicated().sum()
```

[ ]: 23

[ ]:
```
crime.drop_duplicates(inplace= True)
```

[ ]:
```
crime.shape
```

[ ]: (319050, 17)

1.3 Exploring the dataset

[ ]:
```
crime.head(10)
```

[ ]:
```
  INCIDENT_NUMBER  OFFENSE_CODE               OFFENSE_CODE_GROUP  \
0      I182070945           619                          Larceny
1      I182070943          1402                        Vandalism
2      I182070941          3410                            Towed
3      I182070940          3114             Investigate Property
4      I182070938          3114             Investigate Property
5      I182070936          3820  Motor Vehicle Accident Response
6      I182070933           724                       Auto Theft
7      I182070932          3301                  Verbal Disputes
8      I182070931           301                          Robbery
9      I182070929          3301                  Verbal Disputes

                          OFFENSE_DESCRIPTION DISTRICT REPORTING_AREA  \
0                          LARCENY ALL OTHERS      D14            808
1                                   VANDALISM      C11            347
2                         TOWED MOTOR VEHICLE       D4            151
3                        INVESTIGATE PROPERTY       D4            272
4                        INVESTIGATE PROPERTY       B3            421
5  M/V ACCIDENT INVOLVING PEDESTRIAN - INJURY      C11            398
6                                 AUTO THEFT       B2            330
7                              VERBAL DISPUTE       B2            584
8                           ROBBERY - STREET       C6            177
9                              VERBAL DISPUTE      C11            364

  SHOOTING     OCCURRED_ON_DATE  YEAR  MONTH DAY_OF_WEEK  HOUR    UCR_PART  \
0      NaN  2018-09-02 13:00:00  2018      9      Sunday    13    Part One
1      NaN  2018-08-21 00:00:00  2018      8     Tuesday     0    Part Two
2      NaN  2018-09-03 19:27:00  2018      9      Monday    19  Part Three
3      NaN  2018-09-03 21:16:00  2018      9      Monday    21  Part Three
4      NaN  2018-09-03 21:05:00  2018      9      Monday    21  Part Three
5      NaN  2018-09-03 21:09:00  2018      9      Monday    21  Part Three
6      NaN  2018-09-03 21:25:00  2018      9      Monday    21    Part One
7      NaN  2018-09-03 20:39:37  2018      9      Monday    20  Part Three
8      NaN  2018-09-03 20:48:00  2018      9      Monday    20    Part One
9      NaN  2018-09-03 20:38:00  2018      9      Monday    20  Part Three

        STREET        Lat       Long                     Location
0   LINCOLN ST  42.357791 -71.139371  (42.35779134, -71.13937053)
1     HECLA ST  42.306821 -71.060300  (42.30682138, -71.06030035)
2  CAZENOVE ST  42.346589 -71.072429  (42.34658879, -71.07242943)
3   NEWCOMB ST  42.334182 -71.078664  (42.33418175, -71.07866441)
```

```
4           DELHI ST  42.275365 -71.090361  (42.27536542, -71.09036101)
5          TALBOT AVE  42.290196 -71.071590  (42.29019621, -71.07159012)
6         NORMANDY ST  42.306072 -71.082733  (42.30607218, -71.08273260)
7             LAWN ST  42.327016 -71.105551  (42.32701648, -71.10555088)
8   MASSACHUSETTS AVE  42.331521 -71.070853  (42.33152148, -71.07085307)
9           LESLIE ST  42.295147 -71.058608  (42.29514664, -71.05860832)
```

[ ]:
```
crime.tail(10)
```

[ ]:
```
       INCIDENT_NUMBER  OFFENSE_CODE OFFENSE_CODE_GROUP  \
319063   I080542626-00          3125    Warrant Arrests
319064   I080542626-00          1848     Drug Violation
319065   I080542626-00          1849     Drug Violation
319066   I060168073-00          1864     Drug Violation
319067   I060168073-00          3125    Warrant Arrests
319068   I050310906-00          3125    Warrant Arrests
319069   I030217815-08           111           Homicide
319070   I030217815-08          3125    Warrant Arrests
319071   I010370257-00          3125    Warrant Arrests
319072       142052550          3125    Warrant Arrests

                                  OFFENSE_DESCRIPTION DISTRICT  \
319063                                 WARRANT ARREST       A1
319064  DRUGS - POSS CLASS B - INTENT TO MFR DIST DISP       A1
319065            DRUGS - POSS CLASS B - COCAINE, ETC.       A1
319066     DRUGS - POSS CLASS D - INTENT MFR DIST DISP      E13
319067                                 WARRANT ARREST      E13
319068                                 WARRANT ARREST       D4
319069             MURDER, NON-NEGLIGIENT MANSLAUGHTER      E18
319070                                 WARRANT ARREST      E18
319071                                 WARRANT ARREST      E13
319072                                 WARRANT ARREST       D4

       REPORTING_AREA SHOOTING     OCCURRED_ON_DATE  YEAR  MONTH DAY_OF_WEEK  \
319063            111      NaN  2015-08-12 12:00:00  2015      8   Wednesday
319064            111      NaN  2015-08-12 12:00:00  2015      8   Wednesday
319065            111      NaN  2015-08-12 12:00:00  2015      8   Wednesday
319066            912      NaN  2018-01-27 14:01:00  2018      1    Saturday
319067            912      NaN  2018-01-27 14:01:00  2018      1    Saturday
319068            285      NaN  2016-06-05 17:25:00  2016      6      Sunday
319069            520      NaN  2015-07-09 13:38:00  2015      7    Thursday
319070            520      NaN  2015-07-09 13:38:00  2015      7    Thursday
319071            569      NaN  2016-05-31 19:35:00  2016      5     Tuesday
319072            903      NaN  2015-06-22 00:12:00  2015      6      Monday

        HOUR    UCR_PART          STREET        Lat        Long  \
319063    12  Part Three     BOYLSTON ST  42.352312 -71.063705
```

```
319064    12    Part Two        BOYLSTON ST  42.352312 -71.063705
319065    12    Part Two        BOYLSTON ST  42.352312 -71.063705
319066    14    Part Two          CENTRE ST  42.322838 -71.100967
319067    14  Part Three          CENTRE ST  42.322838 -71.100967
319068    17  Part Three        COVENTRY ST  42.336951 -71.085748
319069    13    Part One           RIVER ST  42.255926 -71.123172
319070    13  Part Three           RIVER ST  42.255926 -71.123172
319071    19  Part Three  NEW WASHINGTON ST  42.302333 -71.111565
319072     0  Part Three      WASHINGTON ST  42.333839 -71.080290

                          Location
319063  (42.35231190, -71.06370510)
319064  (42.35231190, -71.06370510)
319065  (42.35231190, -71.06370510)
319066  (42.32283759, -71.10096723)
319067  (42.32283759, -71.10096723)
319068  (42.33695098, -71.08574813)
319069  (42.25592648, -71.12317207)
319070  (42.25592648, -71.12317207)
319071  (42.30233307, -71.11156487)
319072  (42.33383935, -71.08029038)
```

[ ]:
```
crime.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 319050 entries, 0 to 319072
Data columns (total 17 columns):
 #   Column               Non-Null Count   Dtype
---  ------               --------------   -----
 0   INCIDENT_NUMBER      319050 non-null  object
 1   OFFENSE_CODE         319050 non-null  int64
 2   OFFENSE_CODE_GROUP   319050 non-null  object
 3   OFFENSE_DESCRIPTION  319050 non-null  object
 4   DISTRICT             317285 non-null  object
 5   REPORTING_AREA       319050 non-null  object
 6   SHOOTING             1019 non-null    object
 7   OCCURRED_ON_DATE     319050 non-null  object
 8   YEAR                 319050 non-null  int64
 9   MONTH                319050 non-null  int64
 10  DAY_OF_WEEK          319050 non-null  object
 11  HOUR                 319050 non-null  int64
 12  UCR_PART             318960 non-null  object
 13  STREET               308179 non-null  object
 14  Lat                  299052 non-null  float64
 15  Long                 299052 non-null  float64
 16  Location             319050 non-null  object
dtypes: float64(2), int64(4), object(11)
```

```
memory usage: 43.8+ MB
```

[ ]:
```
crime.OCCURRED_ON_DATE = pd.to_datetime(crime.OCCURRED_ON_DATE)
```

[ ]:
```
crime.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 319050 entries, 0 to 319072
Data columns (total 17 columns):
 #   Column               Non-Null Count   Dtype
---  ------               --------------   -----
 0   INCIDENT_NUMBER      319050 non-null  object
 1   OFFENSE_CODE         319050 non-null  int64
 2   OFFENSE_CODE_GROUP   319050 non-null  object
 3   OFFENSE_DESCRIPTION  319050 non-null  object
 4   DISTRICT             317285 non-null  object
 5   REPORTING_AREA       319050 non-null  object
 6   SHOOTING             1019 non-null    object
 7   OCCURRED_ON_DATE     319050 non-null  datetime64[ns]
 8   YEAR                 319050 non-null  int64
 9   MONTH                319050 non-null  int64
 10  DAY_OF_WEEK          319050 non-null  object
 11  HOUR                 319050 non-null  int64
 12  UCR_PART             318960 non-null  object
 13  STREET               308179 non-null  object
 14  Lat                  299052 non-null  float64
 15  Long                 299052 non-null  float64
 16  Location             319050 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(4), object(10)
memory usage: 43.8+ MB
```

[ ]:
```
crime.describe(include = object)
```

[ ]:
```
       INCIDENT_NUMBER               OFFENSE_CODE_GROUP  \
count           319050                           319050
unique          282517                               67
top         I162030584  Motor Vehicle Accident Response
freq                13                            37132

                        OFFENSE_DESCRIPTION DISTRICT REPORTING_AREA SHOOTING  \
count                                319050   317285         319050     1019
unique                                  244       12            879        1
top        SICK/INJURED/MEDICAL - PERSON       B2                           Y
freq                                  18783    49940          20250     1019

       DAY_OF_WEEK     UCR_PART         STREET                   Location
count       319050       318960         308179                     319050
```

```
unique          7         4         4657                        18194
top        Friday  Part Three  WASHINGTON ST  (0.00000000, 0.00000000)
freq        48489    158537        14192                        19998
```

Checking the columns

[ ]:
```
crime.columns
```

[ ]:
```
Index(['INCIDENT_NUMBER', 'OFFENSE_CODE', 'OFFENSE_CODE_GROUP',
       'OFFENSE_DESCRIPTION', 'DISTRICT', 'REPORTING_AREA', 'SHOOTING',
       'OCCURRED_ON_DATE', 'YEAR', 'MONTH', 'DAY_OF_WEEK', 'HOUR', 'UCR_PART',
       'STREET', 'Lat', 'Long', 'Location'],
      dtype='object')
```

[ ]:
```
crime.isnull()
```

[ ]:
```
        INCIDENT_NUMBER  OFFENSE_CODE  OFFENSE_CODE_GROUP  \
0                 False         False               False
1                 False         False               False
2                 False         False               False
3                 False         False               False
4                 False         False               False
…                   …             …                   …
319068            False         False               False
319069            False         False               False
319070            False         False               False
319071            False         False               False
319072            False         False               False

        OFFENSE_DESCRIPTION  DISTRICT  REPORTING_AREA  SHOOTING  \
0                     False     False           False      True
1                     False     False           False      True
2                     False     False           False      True
3                     False     False           False      True
4                     False     False           False      True
…                       …         …              …          …
319068                False     False           False      True
319069                False     False           False      True
319070                False     False           False      True
319071                False     False           False      True
319072                False     False           False      True

        OCCURRED_ON_DATE   YEAR  MONTH  DAY_OF_WEEK   HOUR  UCR_PART  STREET  \
0                  False  False  False        False  False     False   False
1                  False  False  False        False  False     False   False
2                  False  False  False        False  False     False   False
3                  False  False  False        False  False     False   False
```

```
4                      False  False  False         False  False      False   False
…                      …     …     …          …     …          …      …
319068                 False  False  False         False  False      False   False
319069                 False  False  False         False  False      False   False
319070                 False  False  False         False  False      False   False
319071                 False  False  False         False  False      False   False
319072                 False  False  False         False  False      False   False

          Lat   Long  Location
0       False  False     False
1       False  False     False
2       False  False     False
3       False  False     False
4       False  False     False
…         …     …        …
319068  False  False     False
319069  False  False     False
319070  False  False     False
319071  False  False     False
319072  False  False     False

[319050 rows x 17 columns]
```

Checking columns with missing values

[ ]:
```python
crime.columns[np.sum(crime.isnull()) != 0]
```

[ ]:
```
Index(['DISTRICT', 'SHOOTING', 'UCR_PART', 'STREET', 'Lat', 'Long'],
dtype='object')
```

Checking columns with no missing value

[ ]:
```python
crime.columns[np.sum(crime.isnull()) == 0]
```

[ ]:
```
Index(['INCIDENT_NUMBER', 'OFFENSE_CODE', 'OFFENSE_CODE_GROUP',
       'OFFENSE_DESCRIPTION', 'REPORTING_AREA', 'OCCURRED_ON_DATE', 'YEAR',
       'MONTH', 'DAY_OF_WEEK', 'HOUR', 'Location'],
      dtype='object')
```

Checking number of unique values in each columns

[ ]:
```python
for col in crime.columns:
    unique_count = crime[col].nunique()
    print(col + ' has ' + str(unique_count)+ " unique values ")
```

```
INCIDENT_NUMBER has 282517 unique values
OFFENSE_CODE has 222 unique values
OFFENSE_CODE_GROUP has 67 unique values
```

```
OFFENSE_DESCRIPTION has 244 unique values
DISTRICT has 12 unique values
REPORTING_AREA has 879 unique values
SHOOTING has 1 unique values
OCCURRED_ON_DATE has 233229 unique values
YEAR has 4 unique values
MONTH has 12 unique values
DAY_OF_WEEK has 7 unique values
HOUR has 24 unique values
UCR_PART has 4 unique values
STREET has 4657 unique values
Lat has 18178 unique values
Long has 18178 unique values
Location has 18194 unique values
```

1. What are the most common crime in terms of offense group?

[ ]:
```
crime.OFFENSE_CODE_GROUP.value_counts()
```

[ ]:
```
OFFENSE_CODE_GROUP
Motor Vehicle Accident Response              37132
Larceny                                      25935
Medical Assistance                           23540
Investigate Person                           18749
Other                                        18073
                                             …
HUMAN TRAFFICKING                                7
INVESTIGATE PERSON                               4
Biological Threat                                2
HUMAN TRAFFICKING - INVOLUNTARY SERVITUDE        2
Burglary - No Property Taken                     2
Name: count, Length: 67, dtype: int64
```

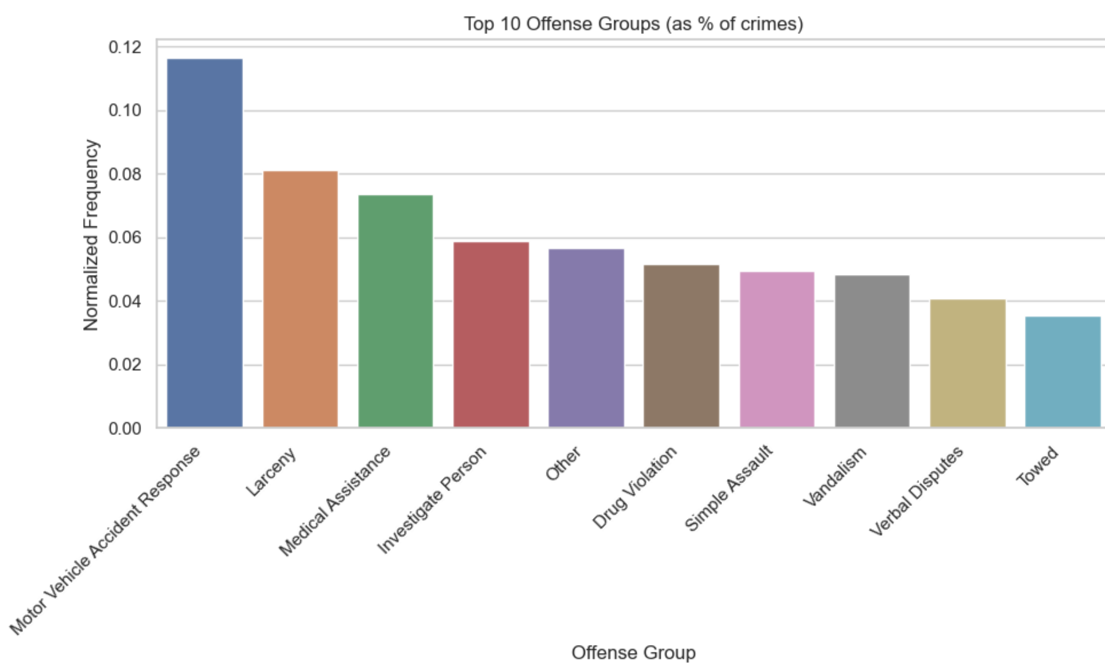
2. Top ten crimes in offense group

[ ]:
```
offense_group_values = crime.OFFENSE_CODE_GROUP.value_counts().head(10)

display(offense_group_values / crime.shape[0])
```

```
OFFENSE_CODE_GROUP
Motor Vehicle Accident Response    0.116383
Larceny                            0.081288
Medical Assistance                 0.073782
Investigate Person                 0.058765
Other                              0.056646
Drug Violation                     0.051857
Simple Assault                     0.049604
Vandalism                          0.048312
Verbal Disputes                    0.041056
```

```
Towed                                  0.035377
Name: count, dtype: float64
```

[ ]:
```
normalized_values = offense_group_values / crime.shape[0]

plt.figure(figsize=(10, 6))  # Set the figure size
sns.set(style="whitegrid")   # Set the style using seaborn

sns.barplot(x=normalized_values.index, y=normalized_values.values)

plt.title('Top 10 Offense Groups (as % of crimes)')
plt.xlabel('Offense Group')
plt.ylabel('Normalized Frequency')

plt.xticks(rotation=45, ha="right")

plt.tight_layout()  # Adjust layout to prevent clipping of labels
plt.show()
```



3. Least common offense group

[ ]:
```
crime.OFFENSE_CODE_GROUP.value_counts().sort_values(ascending = True).head(10)
```

[ ]:
```
OFFENSE_CODE_GROUP
Burglary - No Property Taken                2
HUMAN TRAFFICKING - INVOLUNTARY SERVITUDE   2
```

```
Biological Threat                          2
INVESTIGATE PERSON                         4
HUMAN TRAFFICKING                          7
Gambling                                   8
Manslaughter                               8
Explosives                                27
Phone Call Complaints                     31
Aircraft                                  36
Name: count, dtype: int64
```

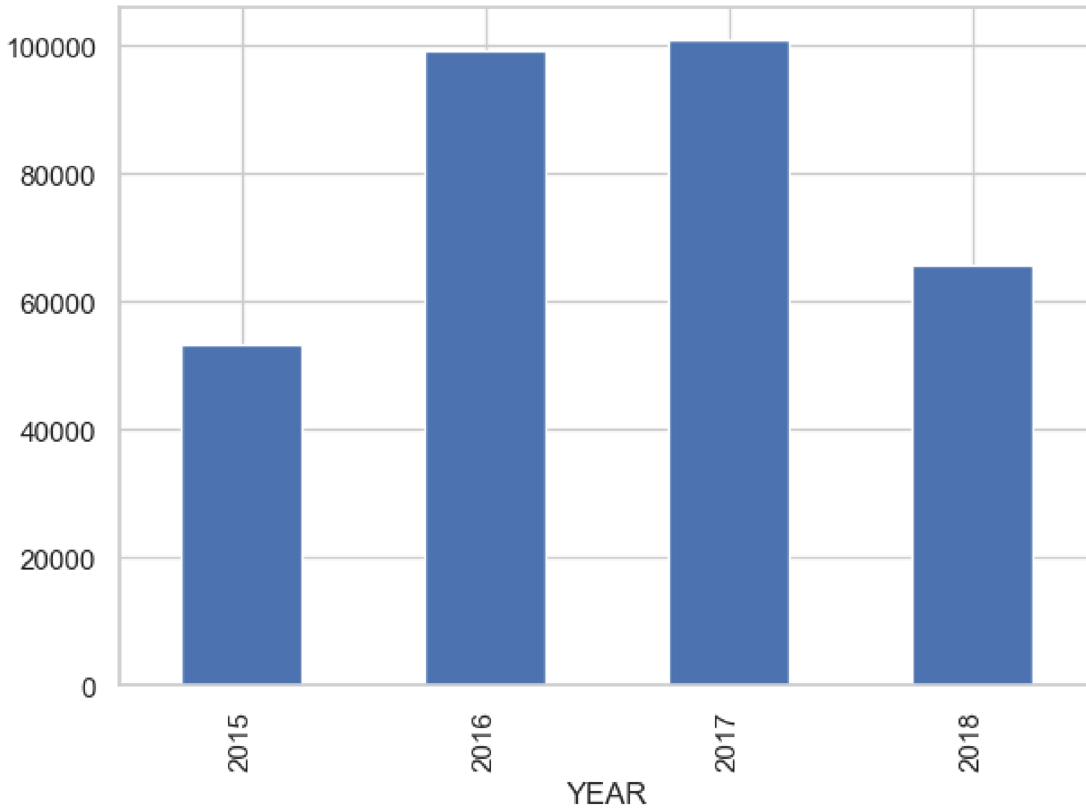
4.What are the most common offense descriptions?

[ ]:
```
crime.OFFENSE_CODE_GROUP.value_counts().sort_values(ascending = False).head(10)
```

[ ]:
```
OFFENSE_CODE_GROUP
Motor Vehicle Accident Response    37132
Larceny                            25935
Medical Assistance                 23540
Investigate Person                 18749
Other                              18073
Drug Violation                     16545
Simple Assault                     15826
Vandalism                          15414
Verbal Disputes                    13099
Towed                              11287
Name: count, dtype: int64
```

4. Which year most crimes are committed?

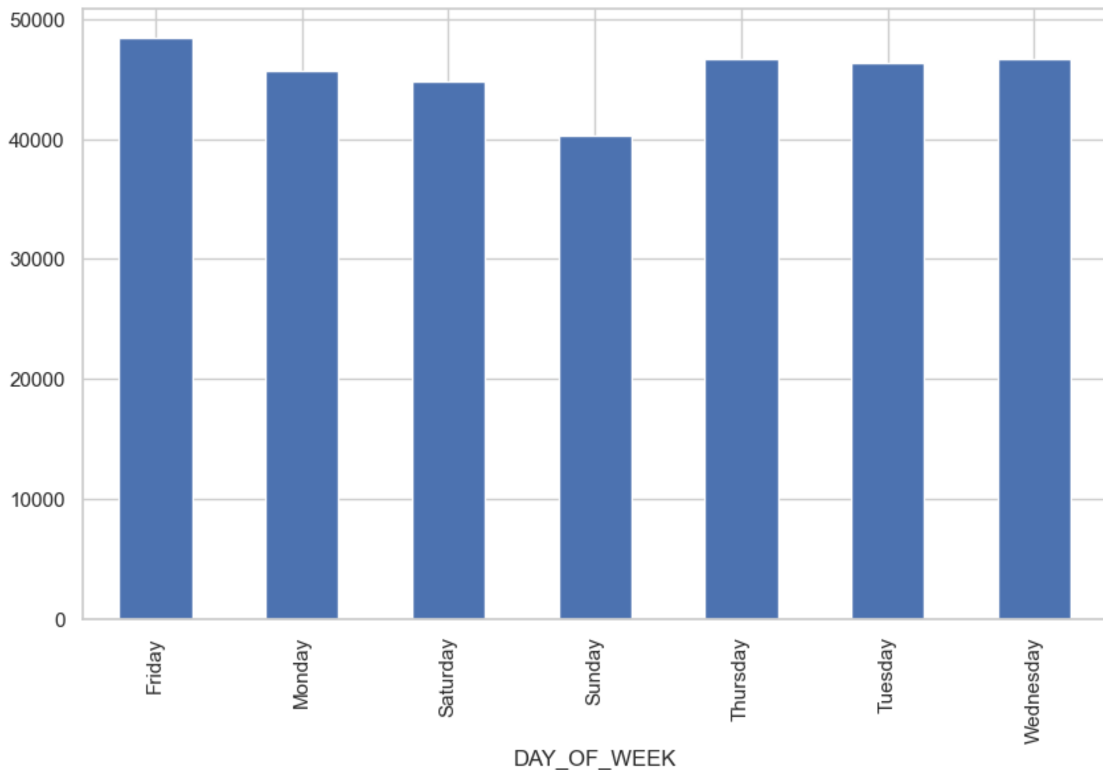
[ ]:
```
crime.groupby('YEAR').count()['INCIDENT_NUMBER'].plot(kind = 'bar')

# Beautify the plot
plt.tight_layout()
```



5. Are there more crime comminted on specific days?

```
[ ]: plt.figure(figsize=(10, 6))  # Set the figure size
     sns.set(style="whitegrid")   # Set the style using seaborn

     crime.groupby('DAY_OF_WEEK').count()['INCIDENT_NUMBER'].plot(kind = 'bar')
```

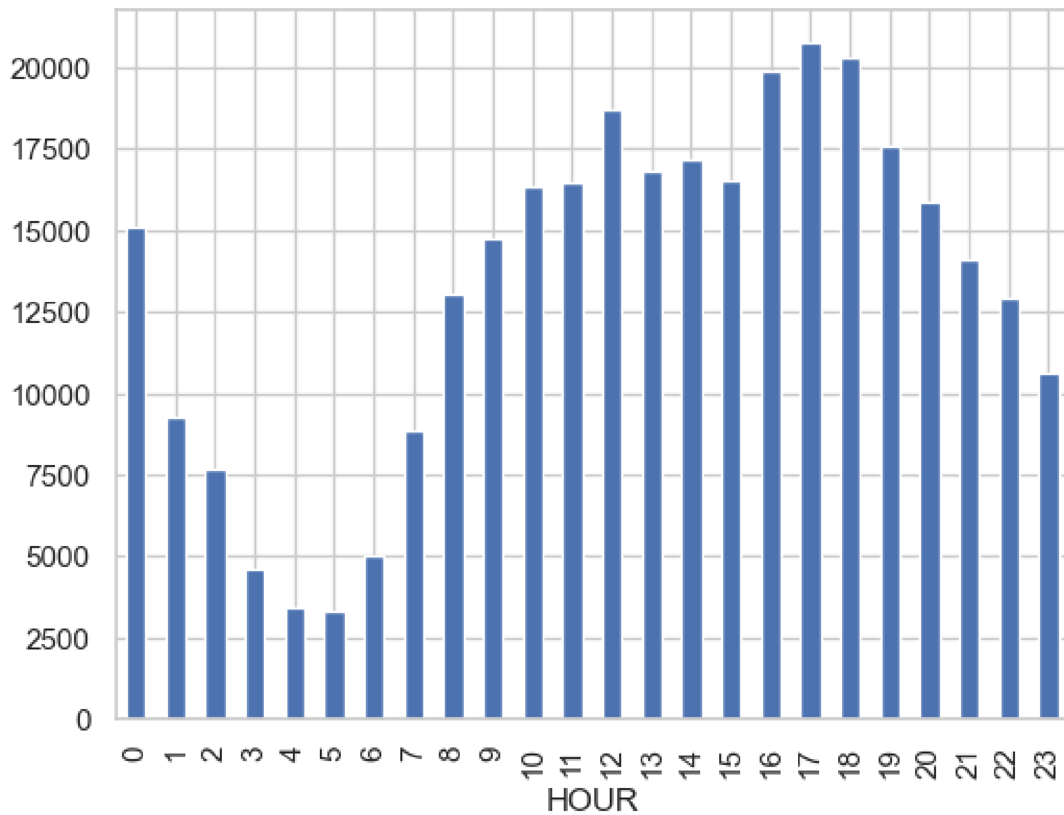
```
[ ]: <Axes: xlabel='DAY_OF_WEEK'>
```



6. Crimes occured during specific hours

[ ]:
```
crime.groupby('HOUR').count()['INCIDENT_NUMBER'].plot(kind = 'bar')
```

[ ]:
```
<Axes: xlabel='HOUR'>
```



7. On which hour of the day most crimes are committed?

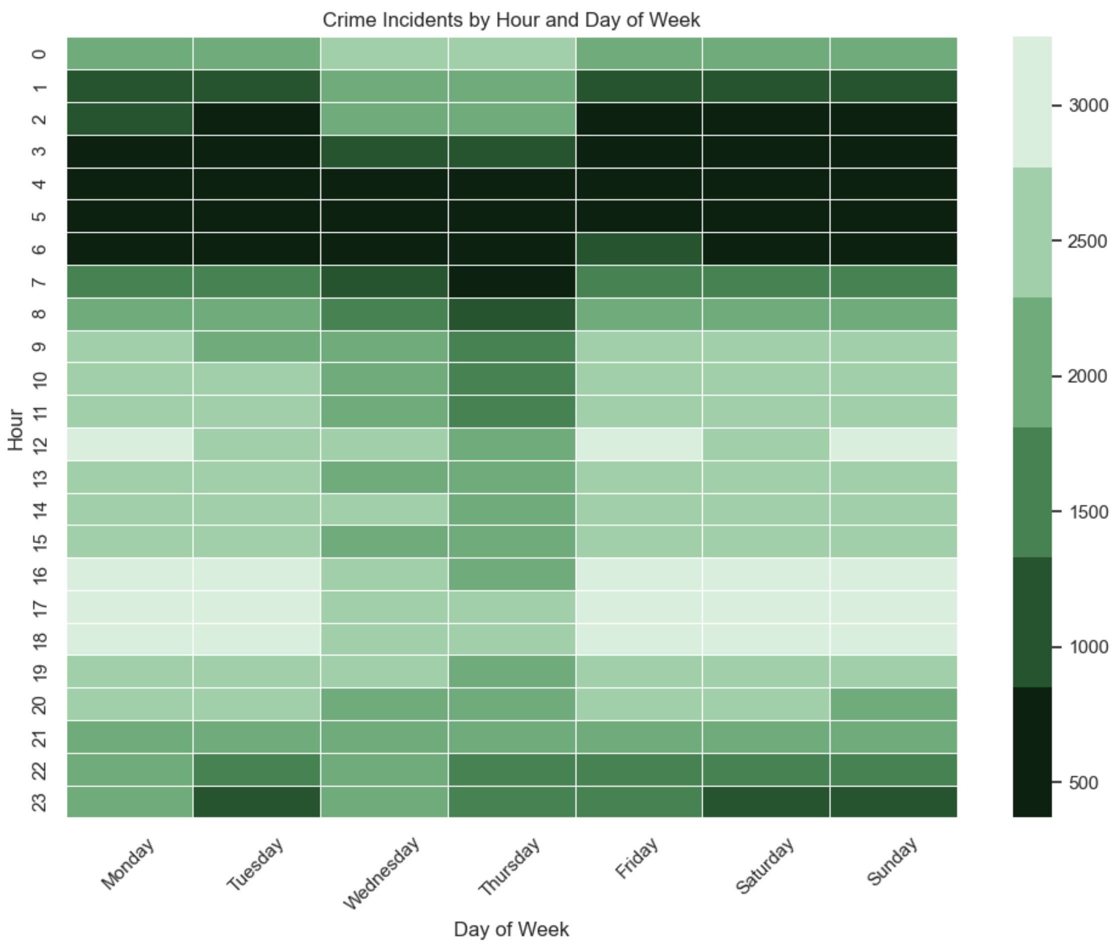
[ ]:
```
crime.groupby(['HOUR','DAY_OF_WEEK']).count()['INCIDENT_NUMBER'].unstack()
```

[ ]:

DAY_OF_WEEK	Friday	Monday	Saturday	Sunday	Thursday	Tuesday	Wednesday
HOUR							
0	2161	2000	2612	2400	2039	1897	1997
1	1275	1058	1855	2043	1077	1017	942
2	952	846	1827	1855	774	641	798
3	532	583	957	1119	526	460	412
4	441	386	672	704	436	399	370
5	485	417	478	517	508	462	444
6	768	709	530	543	866	787	823
7	1398	1352	1078	758	1405	1418	1441
8	2041	2046	1515	1123	2037	2145	2135
9	2299	2148	1812	1457	2325	2322	2377
10	2668	2432	2064	1778	2496	2414	2493
11	2552	2373	2042	1802	2548	2529	2599
12	2860	2746	2588	2135	2821	2681	2845
13	2499	2479	2223	1980	2576	2493	2595
14	2601	2485	2378	2029	2536	2555	2605

15	2566	2438	2084	1918	2531	2503	2479
16	3073	3029	2445	2216	2974	3080	3053
17	3252	3253	2555	2377	2931	3241	3153
18	3010	3089	2528	2326	3033	3217	3098
19	2564	2606	2301	2114	2510	2768	2724
20	2307	2319	2131	2109	2349	2369	2265
21	2089	2003	2077	1902	2070	1925	2043
22	2160	1634	2113	1728	1795	1757	1738
23	1936	1243	1951	1380	1492	1296	1298

[ ]:
```
week_and_hour = crime.groupby(['HOUR','DAY_OF_WEEK']).
    ↪count()['INCIDENT_NUMBER'].unstack()
week_and_hour.columns = ['Monday', 'Tuesday',␣
    ↪'Wednesday','Thursday','Friday','Saturday','Sunday']
#sns.heatmap(week_and_hour, cmap = sns.cubehelix_palette(as_cmap= True))


custom_palette = sns.cubehelix_palette(start=2, rot=0, dark=0.1, light=0.9,␣
    ↪reverse=True)

plt.figure(figsize=(10, 8))
heatmap = sns.heatmap(week_and_hour, cmap=custom_palette, linewidths=0.5)

heatmap.set_title('Crime Incidents by Hour and Day of Week')
heatmap.set_xlabel('Day of Week')
heatmap.set_ylabel('Hour')

plt.xticks(rotation=45)

plt.tight_layout()
```



1.4 Conclusion

This project's analysis enhances our understanding of crime incidents in the USA from 2015 to 2018. By employing data analysis techniques, we uncover valuable insights into crime patterns, distribution, and temporal trends. Law enforcement, policymakers, and researchers can utilize these findings to formulate effective strategies for crime prevention and resource allocation, contributing to safer communities and informed decision-making.