In [1]:
```python
'''Crime in Chicago has been worrisome to the Chicago PD. Reported crimes have been tracked on a daily basis
since 2001 and have been provided in the project data file. The Chicago PD would like to drastically reduce the
spate of violent crimes reported in the city. Being effective involves knowing crime patterns and where they are
likely to occur. It also involves equipping the Police Department appropriately. They have recruited you to
conduct full data analytics and uncover insights from the data that can be used to effectively prepare for and
respond to crimes. They are interested in gleaning any insights that can help them determine What type of
crimes to prepare for, Where these crimes are most likely to occur, What days of the week and periods to expect
these crimes.
'''
# Task
'''Conduct a complete data analytics study and from your analytics, advise the Chicago PD accordingly.'''
```

Out[1]: 'Conduct a complete data analytics study and from your analytics, advise the Chicago PD accordingly.'

In [2]:
```python
import pandas as pd
import os
pd.set_option("display.max_rows", None)
```

In [3]:
```python
os.chdir('/Users/tomisin/Library/Mobile Documents/com~apple~CloudDocs/c.Documents/finalproject_DataAnalysis')
```

In [4]:
```python
df = pd.read_csv('crime_data_Proj1.csv')
```

In [7]:
```python
df = df.rename(columns = {'Unnamed: 0': 'Crime S/N','Primary Type': 'CrimeTyp', 'Location Description': 'CrimeLoc', 'C
```

In [8]:
```python
df.columns
```

Out[8]:
```
Index(['Crime S/N', 'ID', 'Case Number', 'Date', 'Block', 'IUCR', 'CrimeTyp',
       'Description', 'CrimeLoc', 'Arrest', 'Domestic', 'Beat', 'District',
       'Ward', 'CommArea', 'FBI', 'X Coordinate', 'Y Coordinate', 'Year',
       'Updated On', 'Latitude', 'Longitude', 'Location'],
      dtype='object')
```

In [9]:
```python
df.isna().sum()
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```
Out[9]:  Crime S/N         0
         ID                0
         Case Number       1
         Date              0
         Block             0
         IUCR              0
         CrimeTyp          0
         Description       0
         CrimeLoc       2877
         Arrest            0
         Domestic          0
         Beat              0
         District         12
         Ward         184695
         CommArea     184267
         FBI               0
         X Coordinate  23985
         Y Coordinate  23985
         Year              0
         Updated On        0
         Latitude      23985
         Longitude     23985
         Location      23985
         dtype: int64
```

```python
In [10]: dfSub = df[['Crime S/N', 'ID', 'Date', 'Block',
                 'CrimeTyp', 'Description', 'CrimeLoc', 'Arrest',
                 'Domestic', 'District',  'Year', 'Updated On']]
```

```python
In [11]: dfSub = dfSub[0:20000]
```

```python
In [12]: dfSub.info()
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20000 entries, 0 to 19999
Data columns (total 12 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   Crime S/N      20000 non-null  int64
 1   ID             20000 non-null  int64
 2   Date           20000 non-null  object
 3   Block          20000 non-null  object
 4   CrimeTyp       20000 non-null  object
 5   Description    20000 non-null  object
 6   CrimeLoc       19974 non-null  object
 7   Arrest         20000 non-null  bool
 8   Domestic       20000 non-null  bool
 9   District       20000 non-null  float64
 10  Year           20000 non-null  int64
 11  Updated On     20000 non-null  object
dtypes: bool(2), float64(1), int64(3), object(6)
memory usage: 1.6+ MB
```

In [13]:
```python
from dateutil.parser import parse
from datetime import datetime


tCol = dfSub.Date

List = [(datetime.ctime(parse(x[0:-3])),x[-2:]) for x in tCol]
dayList = []
monthList = []
periodList = []
for row in List:
    day = row[0][0:4]
    month = row[0][4:7]
    if row[1]=='AM':
        period = 'Morning'
    elif row[1] =='PM' and int(row[0][11:13])<4:
        period = 'Afternoon'
    elif row[1] =='PM' and int(row[0][11:13])<6:
        period = 'Evening'
    elif row[1] =='PM' and int(row[0][11:13])>5:
```

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```
    else:
```

```python
        period = 'Unknown'

    dayList.append(day)
    monthList.append(month)
    periodList.append(period)

print(len(dayList), len(monthList), len(periodList))

dfSub['month'] = monthList
dfSub['day'] = dayList
dfSub['period']= periodList
dfSub.head()
```

```
20000 20000 20000
```

Out[13]:

	Crime S/N	ID	Date	Block	CrimeTyp	Description	CrimeLoc	Arrest	Domestic	District	Year	Updated On	mont
0	0	6407111	07/26/2008 02:30:00 PM	085XX S MUSKEGON AVE	CRIMINAL DAMAGE	TO VEHICLE	STREET	False	False	4.0	2008	02/28/2018 03:56:25 PM	J
1	1	11398199	07/31/2018 10:57:00 AM	092XX S ELLIS AVE	WEAPONS VIOLATION	UNLAWFUL POSS AMMUNITION	POOL ROOM	True	False	4.0	2018	08/07/2018 04:02:59 PM	J
2	2	5488785	04/27/2007 10:30:00 AM	062XX N TRIPP AVE	BURGLARY	FORCIBLE ENTRY	RESIDENCE	True	False	17.0	2007	02/28/2018 03:56:25 PM	A
3	3	11389116	07/23/2018 08:55:00 AM	0000X N KEELER AVE	ASSAULT	SIMPLE	NURSING HOME/RETIREMENT HOME	False	False	11.0	2018	07/30/2018 03:52:24 PM	J
4	4	12420431	07/11/2021 06:40:00 AM	016XX W HARRISON ST	ASSAULT	AGGRAVATED - HANDGUN	PARKING LOT / GARAGE (NON RESIDENTIAL)	False	False	12.0	2021	07/18/2021 04:56:02 PM	J

In [15]: `dfSub.day.unique()`

Out[15]:
```
array(['Sat ', 'Tue ', 'Fri ', 'Mon ', 'Sun ', 'Wed ', 'Thu '],
      dtype=object)
```

In [16]: `wkList = []`

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```python
        if day in ['Sat ', 'Sun ']:
            wkList.append('Weekend')
        else:
            wkList.append('Weekday')
dfSub['dayType'] = wkList
```

In [17]:
```python
dfSub.columns
```

Out[17]:
```
Index(['Crime S/N', 'ID', 'Date', 'Block', 'CrimeTyp', 'Description',
       'CrimeLoc', 'Arrest', 'Domestic', 'District', 'Year', 'Updated On',
       'month', 'day', 'period', 'dayType'],
      dtype='object')
```

In [18]:
```python
dfSub.isna().sum()
```

Out[18]:
```
Crime S/N        0
ID               0
Date             0
Block            0
CrimeTyp         0
Description      0
CrimeLoc        26
Arrest           0
Domestic         0
District         0
Year             0
Updated On       0
month            0
day              0
period           0
dayType          0
dtype: int64
```

In [19]:
```python
dfFinal = dfSub[['Crime S/N','Block','Date', 'CrimeTyp', 'Description',
        'CrimeLoc', 'Arrest', 'Domestic', 'District',
        'Updated On', 'Year', 'month', 'day', 'period', 'dayType']]
```

In [20]:
```python
dfFinal = dfFinal.rename(columns = {'Crime S/N': 'S/N'})
```

In [77]:
```python
from datetime import datetime
dfFinal['Date'] = pd.to_datetime(dfFinal['Date'])
```

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```
dfFinal["Updated On"] = pd.to_datetime(dfFinal["Updated On"])
dfFinal["Interval"]= (dfFinal["Updated On"] - dfFinal["Date"]).dt.days
```

In [22]:
```
dfFinal= dfFinal.dropna(subset=['CrimeLoc'])
```

In [23]:
```
dfFinal.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 19974 entries, 0 to 19999
Data columns (total 16 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   S/N          19974 non-null  int64
 1   Block        19974 non-null  object
 2   Date         19974 non-null  datetime64[ns]
 3   CrimeTyp     19974 non-null  object
 4   Description  19974 non-null  object
 5   CrimeLoc     19974 non-null  object
 6   Arrest       19974 non-null  bool
 7   Domestic     19974 non-null  bool
 8   District     19974 non-null  float64
 9   Updated On   19974 non-null  datetime64[ns]
 10  Year         19974 non-null  int64
 11  month        19974 non-null  object
 12  day          19974 non-null  object
 13  period       19974 non-null  object
 14  dayType      19974 non-null  object
 15  Interval     19974 non-null  int64
dtypes: bool(2), datetime64[ns](2), float64(1), int64(3), object(8)
memory usage: 2.3+ MB
```

In [24]:
```
#0 = ROBBERY AND THEFT
#1 = ASSAULT AND SEXUAL ASSAULT
#2 = NARCOTICS
#3 = Non-criminal
#4 = Ritualism(Kidnapping, ritualism, offense involving children)
#5 = Prostitution
#6 = Statutory crimes

#0 = violent crimes
```

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```
#2 = Drug crimes
```

```
#3 = law violation crimes
#4 = Statutory crimes
#5 = misdemeanor crimes
#6 = Non-criminal offenses
#7 = Child abuse
#8 = Ritualism
#9 = Sex crimes
#10 = Others
```

Recategorizing 'CrimeTyp' features

In [25]:
```python
fill = (dfFinal.CrimeTyp == 'ASSAULT')| (dfFinal.CrimeTyp  == 'BATTERY')|(dfFinal.CrimeTyp ==  'HOMICIDE') |(dfFinal.C
dfFinal.loc[fill, 'CrimeTyp'] = 'Violent crimes'

fill = (dfFinal.CrimeTyp == 'BURGLARY') | (dfFinal.CrimeTyp  == 'THEFT')| (dfFinal.CrimeTyp  == 'MOTOR VEHICLE THEFT')
dfFinal.loc[fill, 'CrimeTyp'] = 'Property crimes'

fill = (dfFinal.CrimeTyp == 'OTHER NARCOTIC VIOLATION') | (dfFinal.CrimeTyp == 'NARCOTICS')
dfFinal.loc[fill, 'CrimeTyp'] = 'Drug crimes'

fill = (dfFinal.CrimeTyp ==  'WEAPONS VIOLATION') | (dfFinal.CrimeTyp  ==  'PUBLIC PEACE VIOLATION')| (dfFinal.CrimeTy
dfFinal.loc[fill, 'CrimeTyp'] = 'law violation crimes'

fill = (dfFinal.CrimeTyp == 'DECEPTIVE PRACTICE') | (dfFinal.CrimeTyp == 'INTIMIDATION')| (dfFinal.CrimeTyp  == 'STALK
dfFinal.loc[fill, 'CrimeTyp'] = 'Statutory crimes'

fill = (dfFinal.CrimeTyp ==  'CRIMINAL TRESPASS') | (dfFinal.CrimeTyp  ==  'PUBLIC INDECENCY')| (dfFinal.CrimeTyp   ==
dfFinal.loc[fill, 'CrimeTyp'] = 'misdemeanor crimes'

fill = (dfFinal.CrimeTyp == 'NON - CRIMINAL') | (dfFinal.CrimeTyp  == 'NON-CRIMINAL')| (dfFinal.CrimeTyp  ==  'NON-CRI
dfFinal.loc[fill, 'CrimeTyp'] = 'Non-criminal offenses'

fill = (dfFinal.CrimeTyp  ==  'OFFENSE INVOLVING CHILDREN')
dfFinal.loc[fill, 'CrimeTyp'] = 'Child abuse'

fill = (dfFinal.CrimeTyp  ==  'RITUALISM')
dfFinal.loc[fill, 'CrimeTyp'] = 'Ritualism'
```

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```
:Typ  == 'CRIM SEXUAL ASSAULT') | (dfFinal.CrimeT
dfFinal.loc[fill, 'CrimeTyp'] = 'Sex crimes'
```

```
fill = (dfFinal.CrimeTyp  ==   'OTHER OFFENSE')
dfFinal.loc[fill, 'CrimeTyp'] = 'Others'
```

In [26]: `dfFinal.CrimeTyp.unique()`

Out[26]: array(['Violent crimes', 'law violation crimes', 'Property crimes',
        'Drug crimes', 'Others', 'misdemeanor crimes', 'Statutory crimes',
        'Child abuse', 'Sex crimes', 'Ritualism', 'Non-criminal offenses'],
       dtype=object)

Recategorizing 'month' features into integers

In [27]: `dfFinal.dayType.unique()`

Out[27]: array(['Weekend', 'Weekday'], dtype=object)

Recategorizing 'CrimeLoc' features into integers

In [32]:
```
#0 = Residence/Apartment
#1 = Chicago Housing Authority (CHA)
#2 = Parking Lot
#3 = Airport
#4 = Chicago Transport Authority (CTA)
#5 = Nursing Homes
#6 = University/School
#7 = Store
#8 = Hospital
#9 = Place of Worship
#10 = College/University
#11 = Hotel/Motel
#12 = Gas Station
#13 = Movie House/Theatre
#14 = Sports Arena/Stadium
#15 = Factory
#16 = Vehicle
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```
#18 = Bank/ATM
#19 = Club/Bar
#20 = Beauty Salon
#21 = Pool Room
#22 = Street
#23 = Stairwell
#24 = Alley
#25 = Forest reserve/Prairie
#26 = Water
#27 = Railroad property
#28 = Government building
#29 = Highway/Expressway
#30 = Vacant Lot
#31 = Construction site/Abandoned building
#32 = Office
#33 = Jail
#34 = Hall/Hallway
#35 = Others
```

In [29]:
```
fill = (dfFinal.CrimeLoc == 'RESIDENCE')| (dfFinal.CrimeLoc  == 'APARTMENT')|(dfFinal.CrimeLoc ==  'CHA APARTMENT') |(
dfFinal.loc[fill, 'CrimeLoc'] = 'Residence/Apartment'

fill = (dfFinal.CrimeLoc ==  'CHA PARKING LOT/GROUNDS') |(dfFinal.CrimeLoc  == 'PARKING LOT/GARAGE(NON.RESID.)') | (df
dfFinal.loc[fill, 'CrimeLoc'] = 'Chicago Housing Authority (CHA)'

fill = (dfFinal.CrimeLoc == 'PARKING LOT')| (dfFinal.CrimeLoc  == 'PARKING LOT / GARAGE (NON RESIDENTIAL)')|(dfFinal.C
dfFinal.loc[fill, 'CrimeLoc'] = 'Parking Lot'

fill = (dfFinal.CrimeLoc == 'AIRPORT TERMINAL MEZZANINE – NON–SECURE AREA')| (dfFinal.CrimeLoc  == 'AIRPORT TERMINAL U
dfFinal.loc[fill, 'CrimeLoc'] = 'Airport'

fill = (dfFinal.CrimeLoc == 'CTA PLATFORM')| (dfFinal.CrimeLoc  == 'CTA BUS')|(dfFinal.CrimeLoc ==  'CTA TRAIN') |(dfF
dfFinal.loc[fill, 'CrimeLoc'] = 'Chicago Transport Authority (CTA)'

fill = (dfFinal.CrimeLoc == 'NURSING HOME/RETIREMENT HOME')| (dfFinal.CrimeLoc == 'NURSING / RETIREMENT HOME')|(dfFina
dfFinal.loc[fill, 'CrimeLoc'] = 'Nursing Homes'

fill = (dfFinal.CrimeLoc == 'SCHOOL, PUBLIC, GROUNDS')| (dfFinal.CrimeLoc  == 'SCHOOL, PUBLIC, BUILDING')|(dfFinal.Cri
dfFinal.loc[fill, 'CrimeLoc'] = 'University/School'

                                                                     == 'DEPARTMENT STORE')|(dfFinal.CrimeLoc ==  'DF
dfFinal.loc[fill, 'CrimeLoc'] = 'Store'
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```python
fill = (dfFinal.CrimeLoc == 'HOSPITAL BUILDING/GROUNDS')| (dfFinal.CrimeLoc  == 'HOSPITAL BUILDING / GROUNDS')|(dfFina
dfFinal.loc[fill, 'CrimeLoc'] = 'Hospital'

fill = (dfFinal.CrimeLoc == 'CHURCH/SYNAGOGUE/PLACE OF WORSHIP')| (dfFinal.CrimeLoc  == 'CHURCH / SYNAGOGUE / PLACE OF
dfFinal.loc[fill, 'CrimeLoc'] = 'Place of Worship'

fill = (dfFinal.CrimeLoc == 'COLLEGE/UNIVERSITY RESIDENCE HALL')| (dfFinal.CrimeLoc  == 'COLLEGE/UNIVERSITY GROUNDS')|
dfFinal.loc[fill, 'CrimeLoc'] = 'College/University'

fill = (dfFinal.CrimeLoc == 'HOTEL')| (dfFinal.CrimeLoc  == 'HOTEL / MOTEL')|(dfFinal.CrimeLoc ==  'HOTEL/MOTEL') |(df
dfFinal.loc[fill, 'CrimeLoc'] = 'Hotel/Motel'

fill = (dfFinal.CrimeLoc == 'GAS STATION')| (dfFinal.CrimeLoc  == 'GAS STATION DRIVE/PROP.')
dfFinal.loc[fill, 'CrimeLoc'] = 'Gas Station'

fill = (dfFinal.CrimeLoc == 'MOVIE HOUSE/THEATER')| (dfFinal.CrimeLoc  == 'MOVIE HOUSE / THEATER')|(dfFinal.CrimeLoc =
dfFinal.loc[fill, 'CrimeLoc'] = 'Movie House/Theatre'

fill = (dfFinal.CrimeLoc == 'SPORTS ARENA/STADIUM')| (dfFinal.CrimeLoc  == 'SPORTS ARENA / STADIUM')
dfFinal.loc[fill, 'CrimeLoc'] = 'Sports Arena/Stadium'

fill = (dfFinal.CrimeLoc == 'FACTORY')| (dfFinal.CrimeLoc  == 'FACTORY / MANUFACTURING BUILDING') | (dfFinal.CrimeLoc
dfFinal.loc[fill, 'CrimeLoc'] = 'Factory'

fill = (dfFinal.CrimeLoc == 'VEHICLE-COMMERCIAL')| (dfFinal.CrimeLoc  == 'VEHICLE NON-COMMERCIAL')|(dfFinal.CrimeLoc =
dfFinal.loc[fill, 'CrimeLoc'] = 'Vehicle'

fill = (dfFinal.CrimeLoc == 'SIDEWALK')
dfFinal.loc[fill, 'CrimeLoc'] = 'Sidewalk'

fill = (dfFinal.CrimeLoc == 'BANK')| (dfFinal.CrimeLoc  == 'ATM (AUTOMATIC TELLER MACHINE)')|(dfFinal.CrimeLoc == 'COI
dfFinal.loc[fill, 'CrimeLoc'] = 'Bank/ATM'

fill = (dfFinal.CrimeLoc == 'CLUB')| (dfFinal.CrimeLoc  == 'ATHLETIC CLUB')| (dfFinal.CrimeLoc  == 'BAR OR TAVERN') |(
dfFinal.loc[fill, 'CrimeLoc'] = 'Club/Bar'

fill = (dfFinal.CrimeLoc == 'BARBERSHOP')| (dfFinal.CrimeLoc  == 'BARBER SHOP/BEAUTY SALON')
dfFinal.loc[fill, 'CrimeLoc'] = 'Beauty Salon'
```

```python
dfFinal.loc[fill, 'CrimeLoc'] = 'Pool Room'
```

```python
fill = (dfFinal.CrimeLoc == 'STREET')
dfFinal.loc[fill, 'CrimeLoc'] = 'Street'

fill = (dfFinal.CrimeLoc == 'STAIRWELL')
dfFinal.loc[fill, 'CrimeLoc'] = 'Stairwell'

fill = (dfFinal.CrimeLoc == 'ALLEY')| (dfFinal.CrimeLoc  == 'BOWLING ALLEY')
dfFinal.loc[fill, 'CrimeLoc'] = 'Alley'

fill = (dfFinal.CrimeLoc == 'FOREST PRESERVE')| (dfFinal.CrimeLoc  == 'PRAIRIE')
dfFinal.loc[fill, 'CrimeLoc'] = 'Forest reserve/Prairie'

fill = (dfFinal.CrimeLoc == 'LAKEFRONT / WATERFRONT / RIVERBANK')| (dfFinal.CrimeLoc  == 'LAKEFRONT/WATERFRONT/RIVERBA
dfFinal.loc[fill, 'CrimeLoc'] = 'Water'

fill = (dfFinal.CrimeLoc == 'OTHER RAILROAD PROP / TRAIN DEPOT')| (dfFinal.CrimeLoc  == 'RAILROAD PROPERTY')| (dfFinal
dfFinal.loc[fill, 'CrimeLoc'] = 'Railroad'

fill = (dfFinal.CrimeLoc == 'GOVERNMENT BUILDING/PROPERTY')| (dfFinal.CrimeLoc  == 'FEDERAL BUILDING')|(dfFinal.CrimeL
dfFinal.loc[fill, 'CrimeLoc'] = 'Government building'

fill = (dfFinal.CrimeLoc == 'HIGHWAY/EXPRESSWAY')| (dfFinal.CrimeLoc  == 'HIGHWAY / EXPRESSWAY')|(dfFinal.CrimeLoc ==
dfFinal.loc[fill, 'CrimeLoc'] = 'Highway/Expressway'

fill = (dfFinal.CrimeLoc == 'VACANT LOT/LAND')| (dfFinal.CrimeLoc  == 'VACANT LOT / LAND')|(dfFinal.CrimeLoc == 'EXPRE
dfFinal.loc[fill, 'CrimeLoc'] = 'Vacant Lot'

fill = (dfFinal.CrimeLoc == 'ABANDONED BUILDING')| (dfFinal.CrimeLoc  == 'CONSTRUCTION SITE')|(dfFinal.CrimeLoc == 'FA
dfFinal.loc[fill, 'CrimeLoc'] = 'Construction site/Abandoned building'

fill = (dfFinal.CrimeLoc == 'OFFICE')| (dfFinal.CrimeLoc  == 'LIVERY STAND OFFICE')|(dfFinal.CrimeLoc == 'COMMERCIAL /
dfFinal.loc[fill, 'CrimeLoc'] = 'Office'

fill = (dfFinal.CrimeLoc == 'JAIL / LOCK-UP FACILITY')
dfFinal.loc[fill, 'CrimeLoc'] = 'Jail'

fill = (dfFinal.CrimeLoc == 'BANQUET HALL')| (dfFinal.CrimeLoc  == 'HALLWAY')|(dfFinal.CrimeLoc ==  'VESTIBULE')
dfFinal.loc[fill, 'CrimeLoc'] = 'Hall/Hallway'

                                                      IT')|(dfFinal.CrimeLoc ==  'OTHER (SPECIFY)') |(o
dfFinal.loc[fill, 'CrimeLoc'] = 'Others'
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

In [31]: `dfFinal.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 19974 entries, 0 to 19999
Data columns (total 16 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   S/N           19974 non-null  int64
 1   Block         19974 non-null  object
 2   Date          19974 non-null  datetime64[ns]
 3   CrimeTyp      19974 non-null  object
 4   Description   19974 non-null  object
 5   CrimeLoc      19974 non-null  object
 6   Arrest        19974 non-null  bool
 7   Domestic      19974 non-null  bool
 8   District      19974 non-null  float64
 9   Updated On    19974 non-null  datetime64[ns]
 10  Year          19974 non-null  int64
 11  month         19974 non-null  object
 12  day           19974 non-null  object
 13  period        19974 non-null  object
 14  dayType       19974 non-null  object
 15  Interval      19974 non-null  int64
dtypes: bool(2), datetime64[ns](2), float64(1), int64(3), object(8)
memory usage: 2.8+ MB
```

Univarate analysis using Plotly

In [ ]: `!pip install chart_studio`

In [ ]: `!pip install cufflinks`

In [34]:
```python
import pandas as pd
import numpy as np
import chart_studio.plotly as py
import cufflinks as cf
import seaborn as sns
```

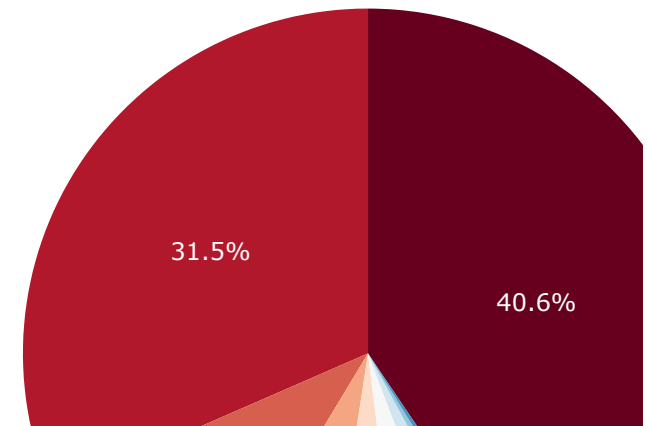File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```python
import plotly.graph_objects as go
```

```python
import plotly as plt
%matplotlib inline
fig = go.Figure()


# Make Plotly work in your Jupyter Notebook
from plotly.offline import download_plotlyjs, init_notebook_mode, plot, iplot
init_notebook_mode(connected=True)
# Use Plotly locally
cf.go_offline()
```

In [35]:
```python
dfFinal['Year']= dfFinal['Year'].astype(str)
dfFinal['District']= dfFinal['District'].astype(str)
```

In [36]:
```python
fig = px.bar(dfFinal, x='CrimeTyp', title = 'Crime types in Chicago')
fig.update_traces(dict(marker_line_width=0))
fig.update_layout(xaxis = {'categoryorder':'total descending'})
fig.show()
with open("CrimeTyp_uni.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale=20))
```

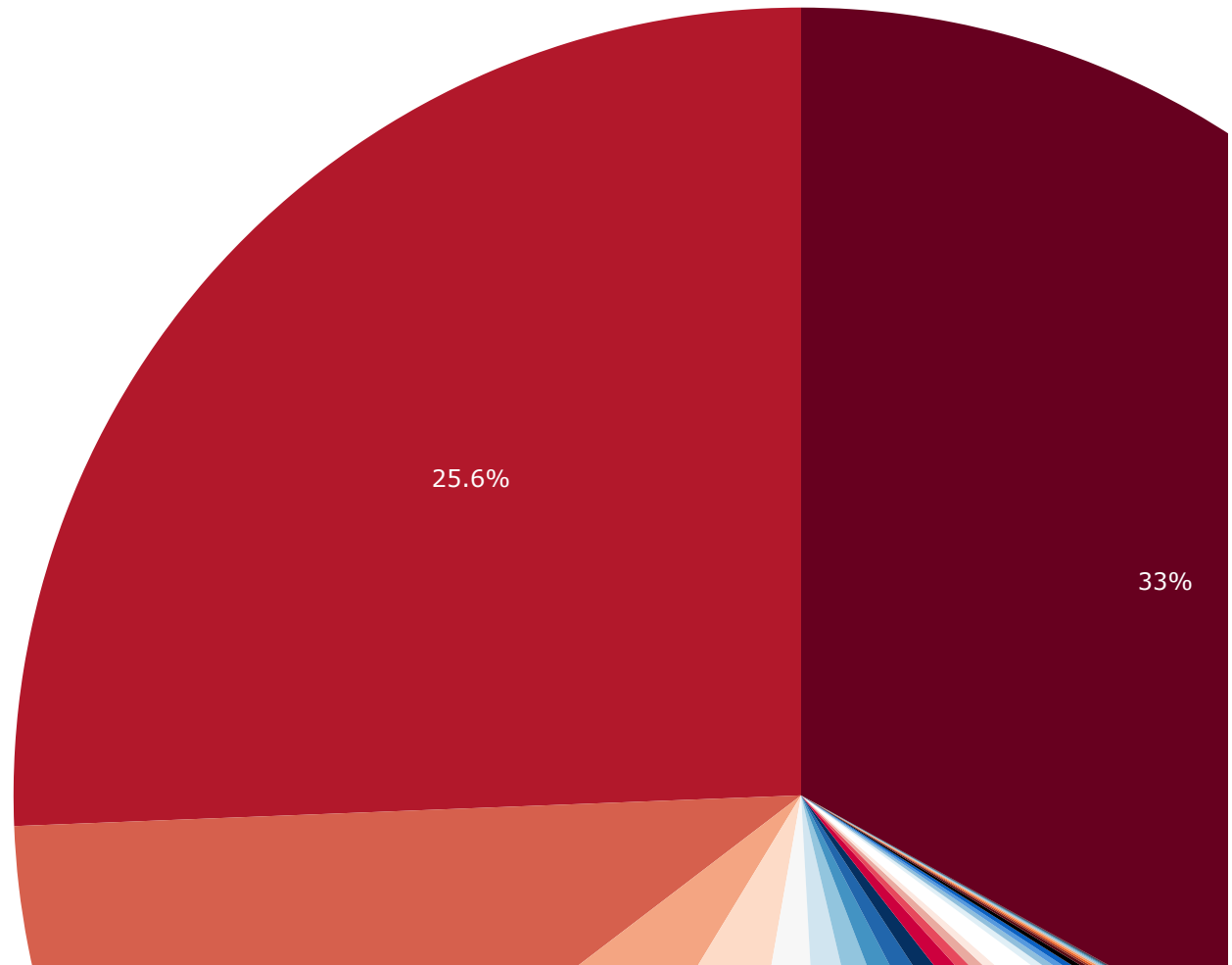File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

Crime types in Chicago
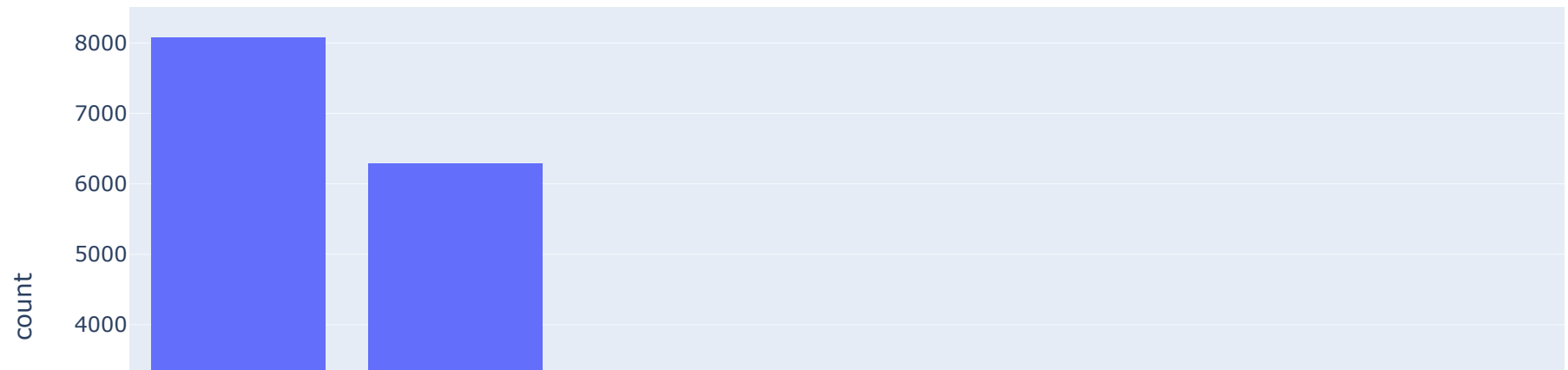

```
In [37]:  #Most rampant crimes are violent, property crimes and drug crimes
          px.pie(dfFinal, values='S/N', names='CrimeTyp',
                 title='Recorded Crime types in Chicago',
                 color_discrete_sequence=px.colors.sequential.RdBu)
```
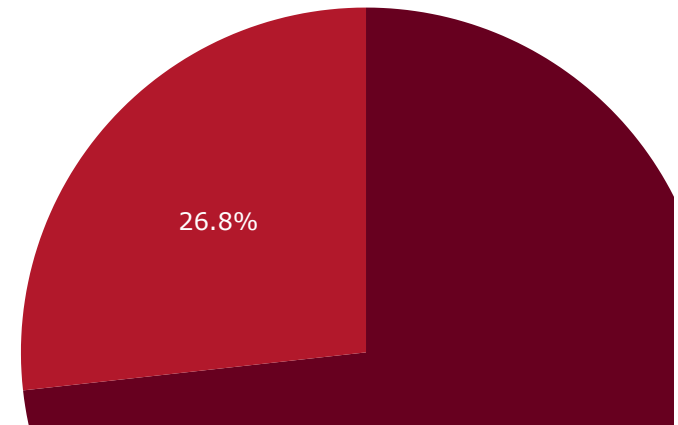
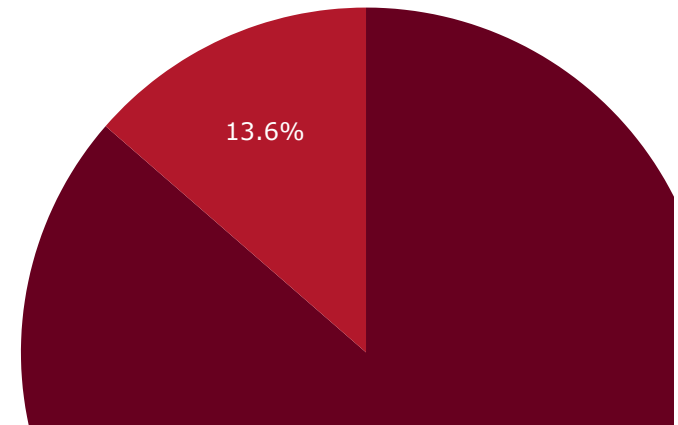File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

Recorded Crime types in Chicago


```
In [38]:  #crime reports all round the week
          fig = px.bar(dfFinal, x='day', title = 'Crime report all week round')
          fig.update_traces(dict(marker_line_width=0))
          fig.update_layout(xaxis = {'categoryorder':'total descending'})
          fig.show()
          with open("day_uni.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale=20))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

Crime report all week round


```
In [39]:   #frequent reported Crime types are in Residence/apartments, on the streets, sidewalks and even in stores
           px.pie(dfFinal, values='S/N', names='CrimeLoc', height = 1000,
                  title='Recorded Crime Locations in Chicago from 2001-2022',
                  color_discrete_sequence=px.colors.sequential.RdBu)
```

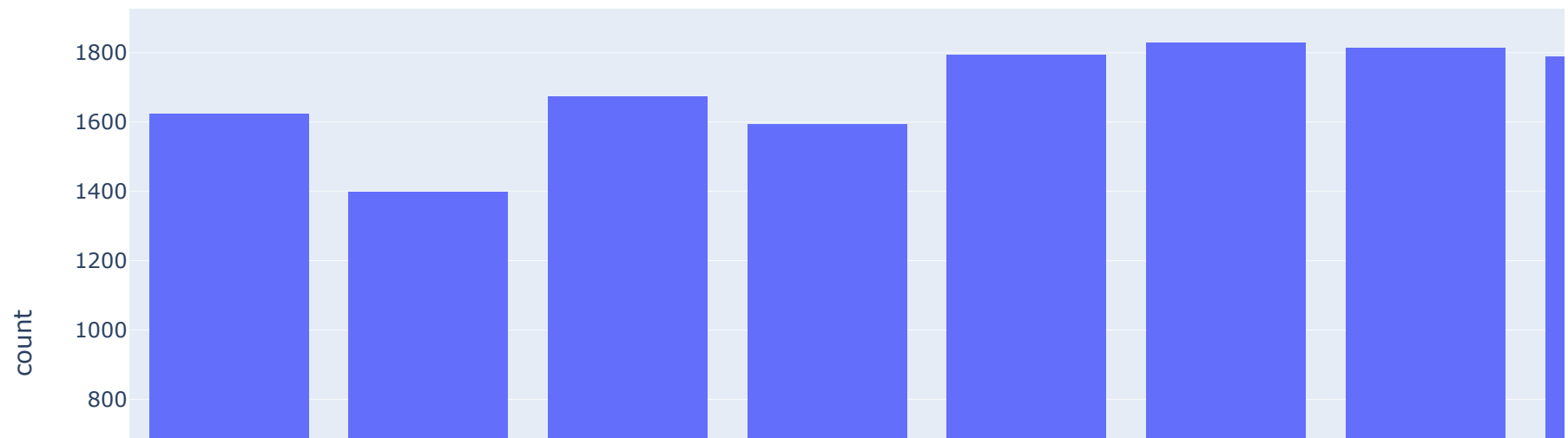File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

Recorded Crime Locations in Chicago from 2001-2022

25.6%

33%

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In [40]:
```python
#26.3% Crime arrests. More arrests need to be considered
px.pie(dfFinal, values='S/N', names='Arrest',
       title='Arrest rates in Chicago',
       color_discrete_sequence=px.colors.sequential.RdBu)
```

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Arrest rates in Chicago


```
In [41]:  #low domestic crimes reported (14%)
          px.pie(dfFinal, values='S/N', names='Domestic',
                 title='Domestic crime rates in Chicago', color_discrete_sequence=px.colors.sequential.RdBu)
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

Domestic crime rates in Chicago


```
In [42]:  #Lesser crime rates at the beginning and at the end of the year
          #(in the months of Jan, Feb, March, April; Nov and Dec)
          #Higher crime rates in the rest of the Month: May, June, July, Aug, Sep, Oct.
          #Increased surveillance mandatory during these periods.
          fig = px.bar(dfFinal, x ='month',
                       category_orders= {"month": ["Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug", "Sep", "Oct", "Nov",
          fig.update_traces(dict(marker_line_width=0))
          fig.show()
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```
          f.write(plt.io.to_image(fig, format='png', scale=20))
```

In [58]:
```python
fig = px.bar(dfFinal, x = 'Year', title = 'Crime trends over the years in Chicago (2001-2022)', category_orders ={"Yea
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("Year.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js
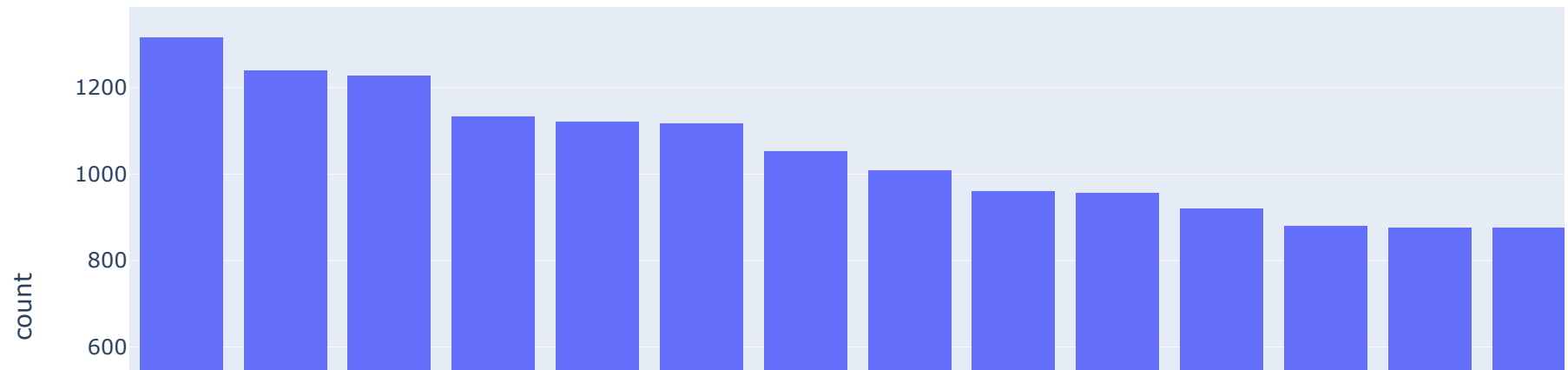
Crime trends over the years in Chicago (2001-2022)
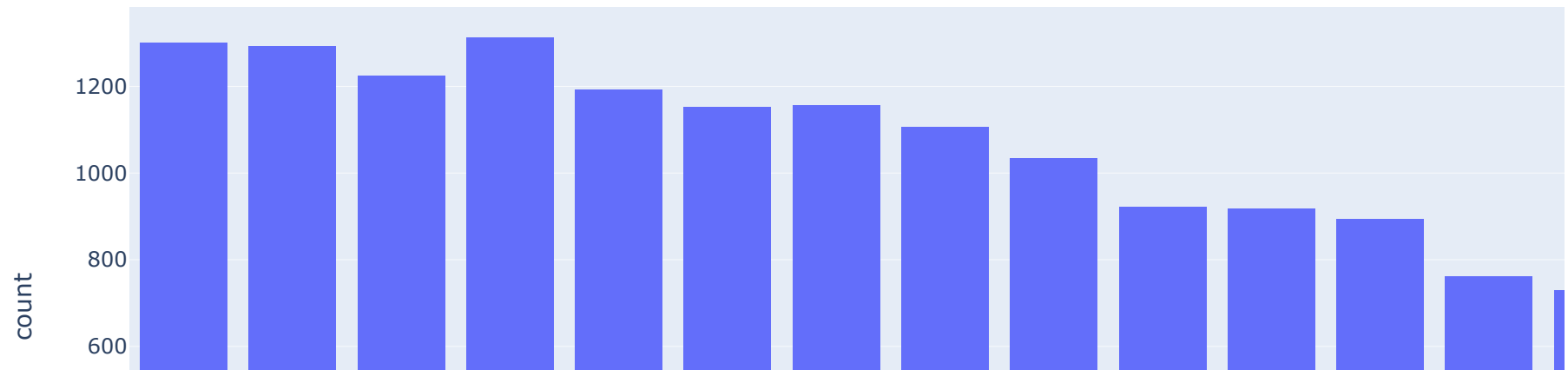

```
In [43]:  fig = px.bar(dfFinal, x = 'District',
                       title = 'Crime rate in each district in Chicago')
          fig.update_layout(xaxis = {'categoryorder':'total descending'})
          fig.update_traces(dict(marker_line_width=0))
          fig.show()
          with open("District_uni.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale=20))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

Crime rate in each district in Chicago

Bivarate analysis

In [ ]:

In [44]:
```
#Lesser violent and property crime rates at the beginning and at the end of the year
#(in the months of Jan, Feb, March, April; Nov and Dec)
```

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`, June, July, Aug, Sep, Oct.`

```python
#Increased surveillance mandatory during these periods.
fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'month', barmode ='group', title = 'CrimeTyp versus month',
             category_orders= {"month": ["Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug", "Sep", "Oct", "Nov",
fig.update_traces(dict(marker_line_width=0))
fig.update_layout(xaxis = {'categoryorder':'total descending'})
fig.show()
with open("CrimeTyp_month.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 20))
```

CrimeTyp versus month

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```
In [48]:  #category_orders={'month': ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', "Jul", "Aug", "Sep", "Oct", "Nov", "Dec"]})
```
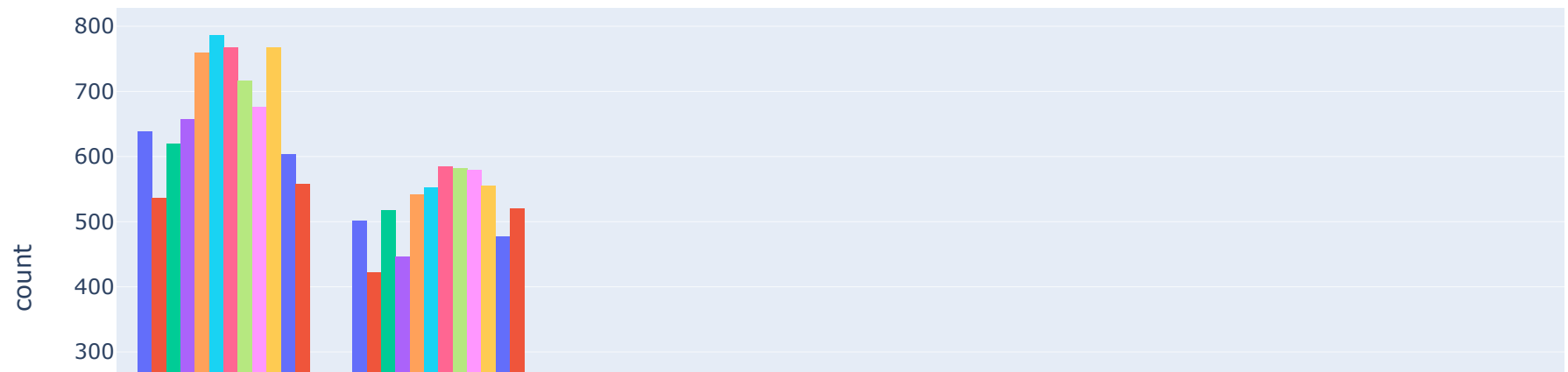
```
#category_orders={"day": ["Mon", "Tue", "Wed", "Thu", "Fri","Sat", "Sun"]})
#catergory_orders = {"period": ["Morning", "Afternoon", "Evening", "Night"]})
#category_orders ={"Year": ["2001", "2002", "2003", "2004", "2005", "2006", "2007", "2008", "2009", "2010", "2011", "2
#category_orders ={"District": ["1.0", "2.0", "3.0", "4.0", "5.0", "6.0", "7.0", "8.0", "9.0", "10.0", "11.0", "12.0",
```

In [45]:
```
#Relatively equal crime rates day in day out, no obvious pattern or trend whatsoever.
#Surveillance must take place everyday
fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'day', barmode = 'group', title = 'CrimeTyp versus day')
fig.update_layout(xaxis = {'categoryorder':'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeTyp_day.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 20))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js
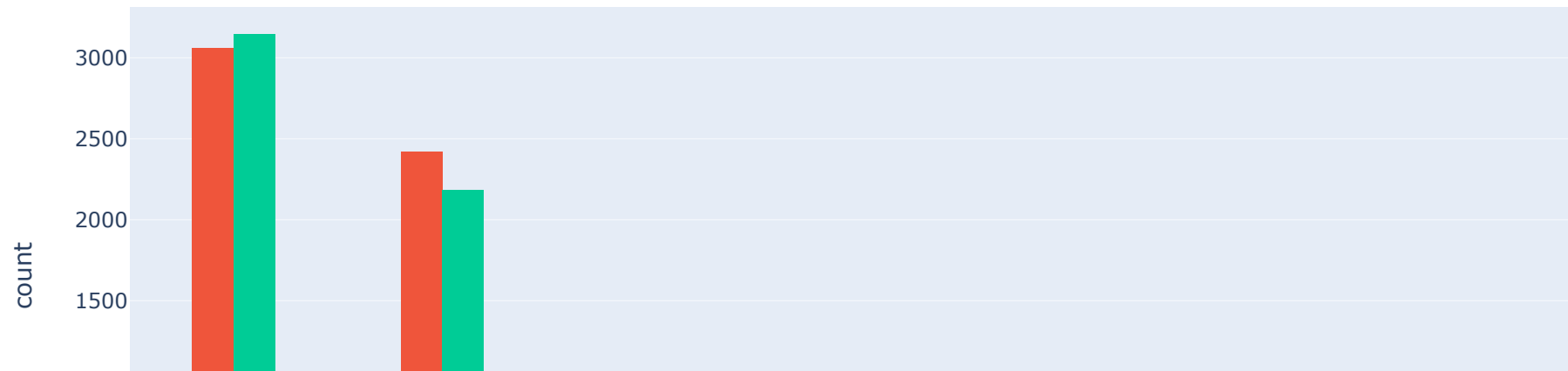
CrimeTyp versus day
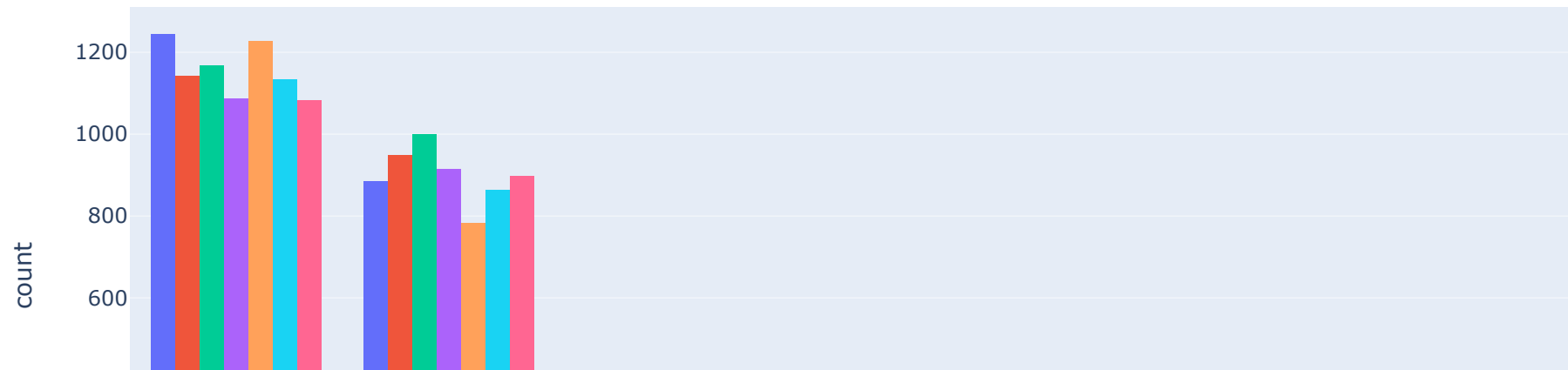

```
In [46]:  #Higher crime rate in the mornings and nights that in the afternoon and evenings (i.e from 5pm till 11:59am)
          #There must be increased surveillance during this period everyday
          fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'period', barmode ='group', title = 'CrimeTyp versus period')
          fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
          fig.update_traces(dict(marker_line_width=0))
          fig.show()
          with open("CrimeTyp_period.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale = 20))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js
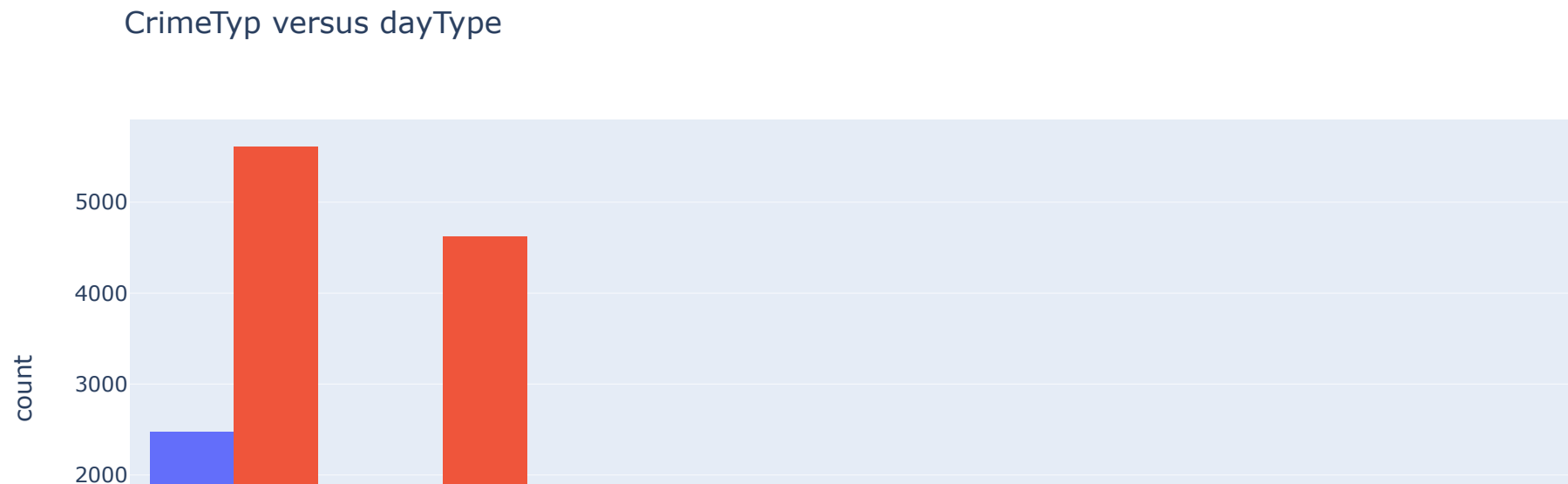
CrimeTyp versus period


```
In [47]: #Relatively equal crime rates day in day out, no obvious pattern or trend whatsoever.
         #Surveillance must take place everyday
         fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'dayType', title = 'CrimeTyp versus dayType')
         fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
         fig.update_traces(dict(marker_line_width=0))
         fig.show()
         with open("CrimeTyp_dayType.png", 'wb') as f:
             f.write(plt.io.to_image(fig, format='png', scale = 20))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeTyp versus dayType
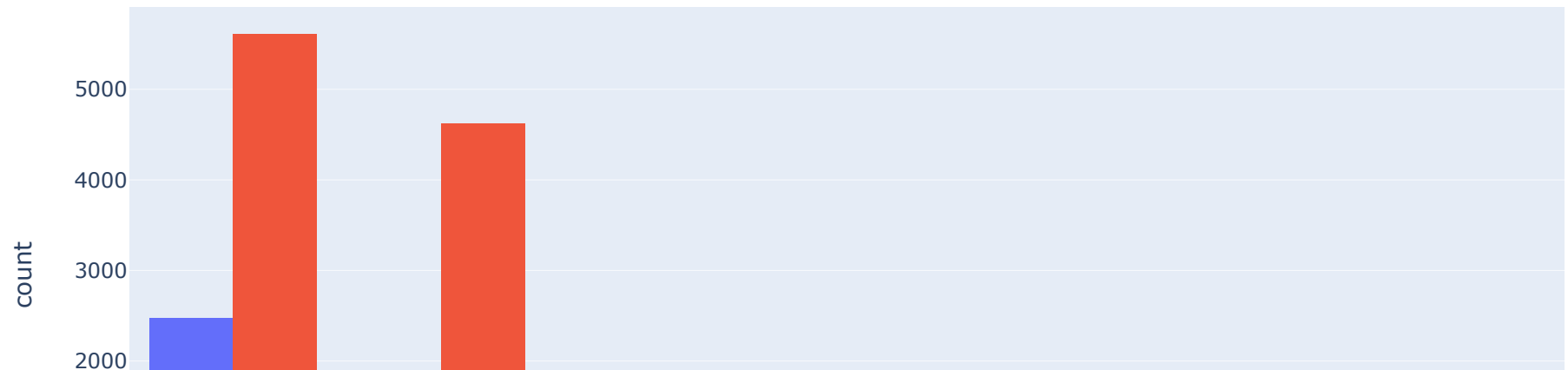
In [48]:
```python
#With arrests(almost all involved drug and law violation criminals were arrested,
#More attention should be diverted to more frequent crimes like: violent crimes and property crimes
#drug related crimes. More
fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'Arrest', title = 'CrimeTyp versus Arrest')
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeTyp_Arrest.png", 'wb') as f:
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js
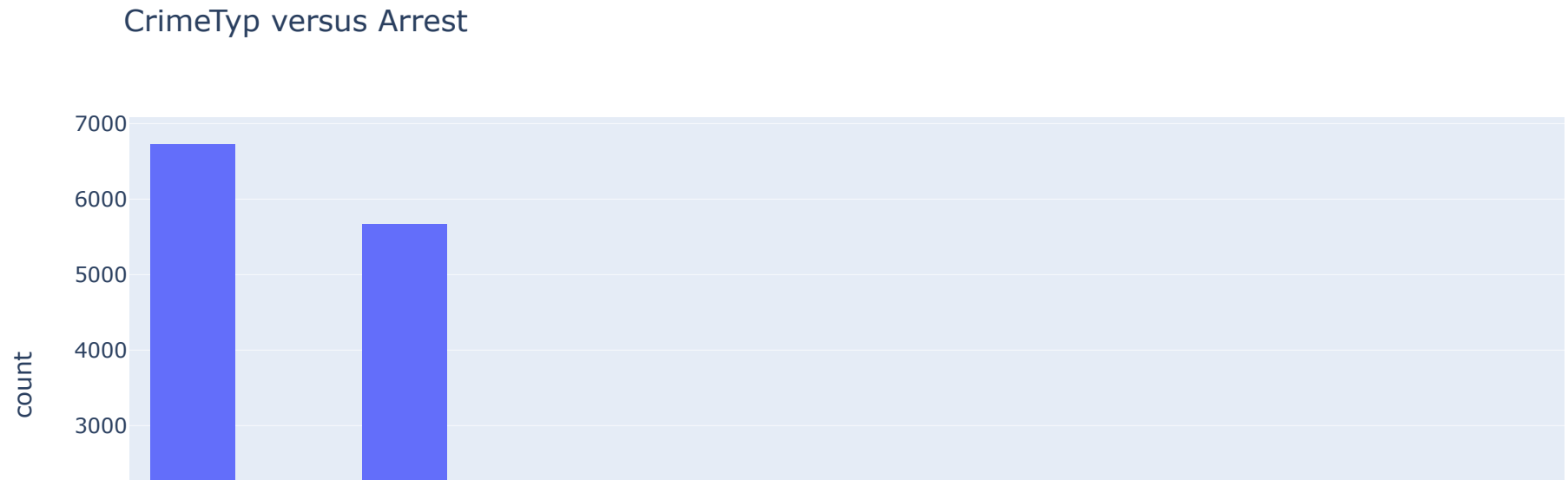
CrimeTyp versus Arrest


```
In [52]:  fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'dayType', title = 'CrimeTyp versus dayType')
          fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
          fig.update_traces(dict(marker_line_width=0))
          fig.show()
          with open("CrimeTyp_dayType.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale = 30))
```
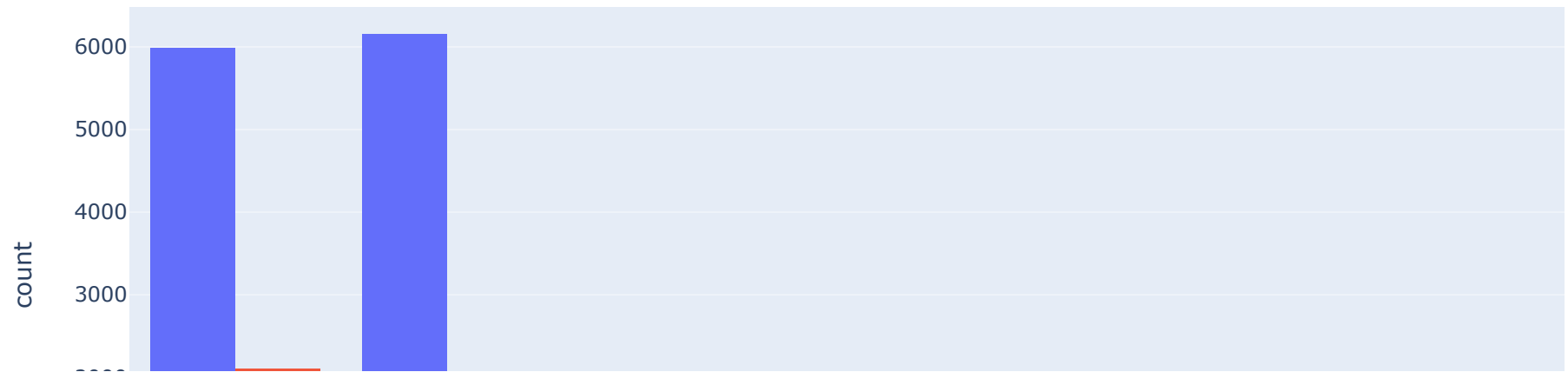
File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeTyp versus dayType


```
In [53]:  #Majority of the reported crimes are non-domestic.
          fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'Domestic', title = 'CrimeTyp versus Domestic')
          fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
          fig.update_traces(dict(marker_line_width=0))
          fig.show()
          with open("CrimeTyp_Domestic.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale = 20))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeTyp versus Domestic


```
In [54]:  #Most of the most prevalent crime types in Chicago happen on weekdays
          #More surveillance on weekdays than on weekends
          fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'dayType', title = 'CrimeLoc versus dayType')
          fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
          fig.update_traces(dict(marker_line_width=0))
          fig.show()
          with open("CrimeLoc_dayType.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale = 30))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js
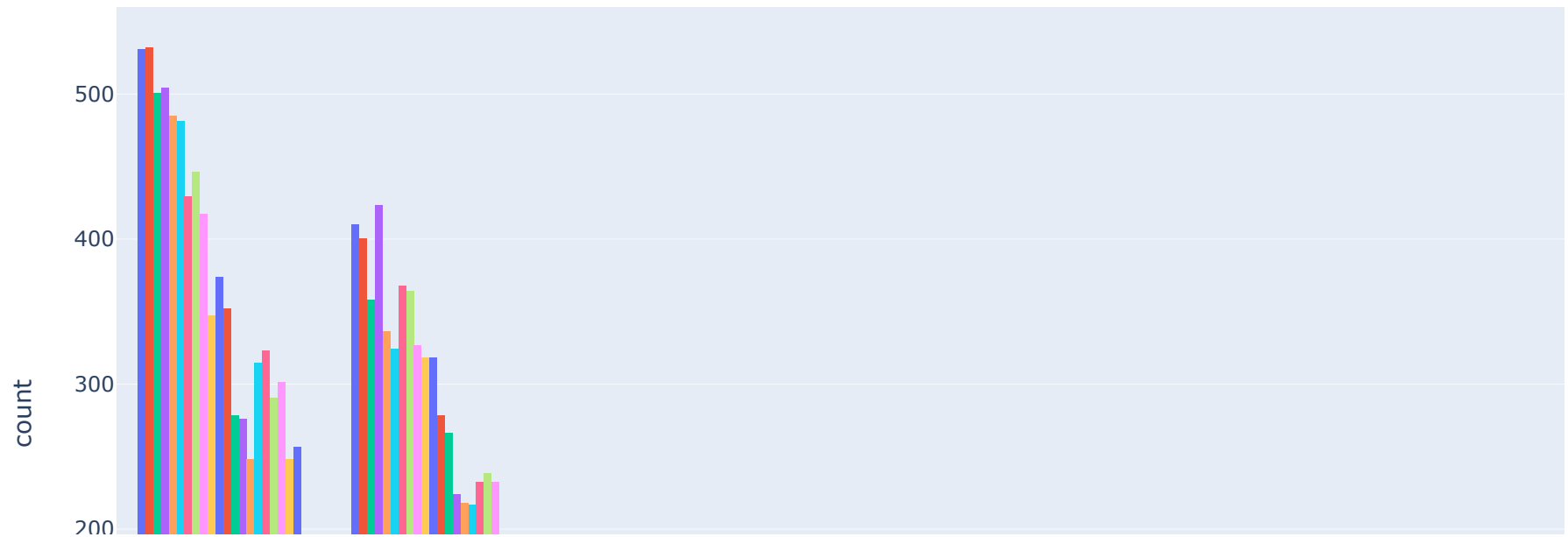
CrimeLoc versus dayType
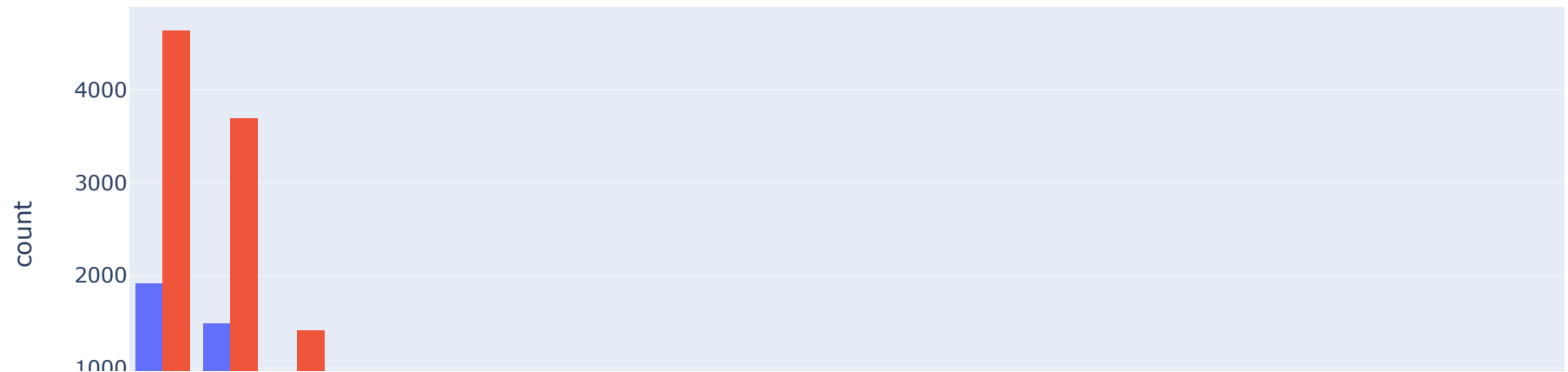

```
In [57]:  fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'Year', barmode = 'group', title = 'CrimeTyp versus Year', height = 680,
                    category_orders ={"Year": ["2001", "2002", "2003", "2004", "2005", "2006", "2007", "2008", "2009", "2010"
          fig.update_traces(dict(marker_line_width=0))
          fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
          fig.show()
          with open("CrimeTyp_Year.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale = 30))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js
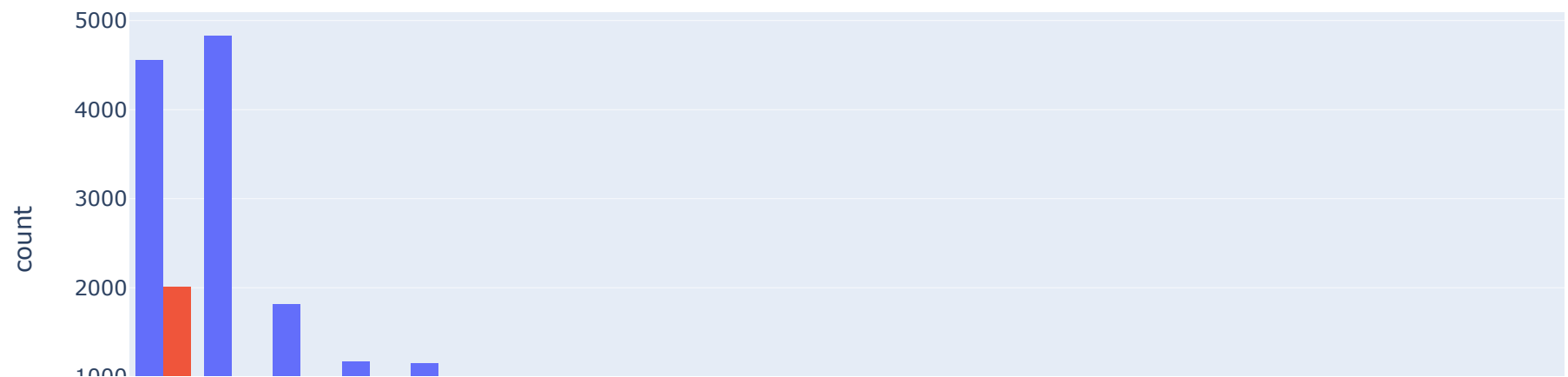
CrimeTyp versus Year

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

In [59]: #There seems to be a significant amount of domestic voilence happening in apartments or residences.

```python
#NO domestic violence happening on the streets, on sidewalks and in stores.
fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'Domestic', title = 'CrimeLoc versus Domestic')
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeLoc_Domestic.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```
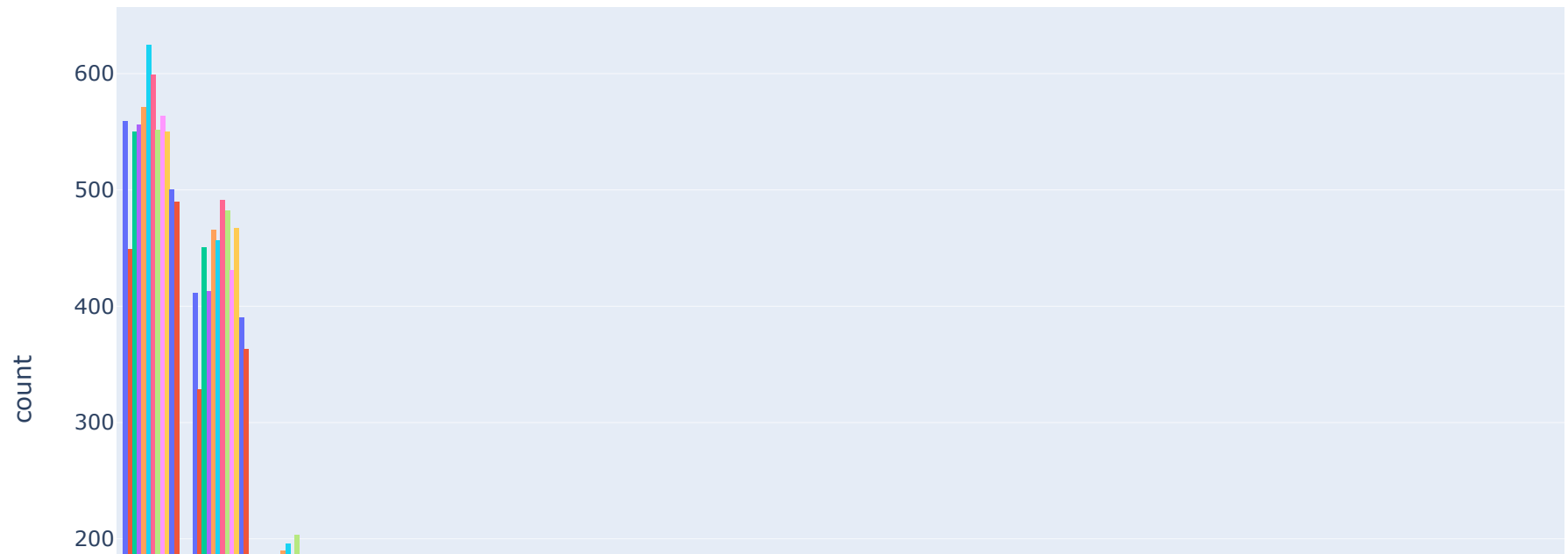
CrimeLoc versus Domestic


```python
fig = px.bar(dfFinal, ...                          ...up', title = 'CrimeLoc versus month',height = 700
                 category_orders= { month : [ Jan , Feb , Mar , Apr , May", "Jun", "Jul", "Aug", "Sep", "Oct", "Nov",
```

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```python
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("Crimeloc_month.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```

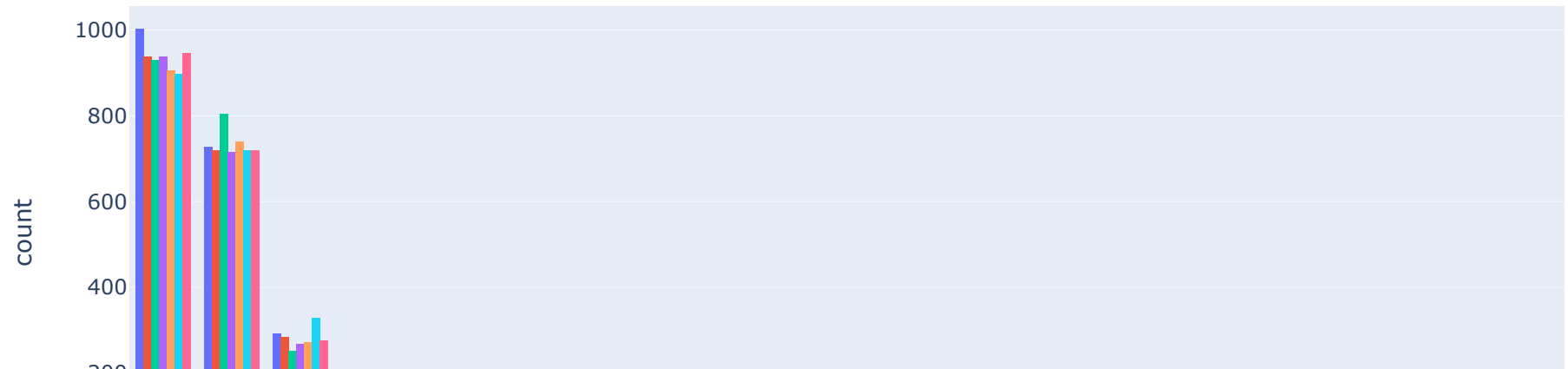File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeLoc versus month

```python
#No specific day for crime happenings in Chicago
#relatively equal number of crime type for each crime location all day round
#Surveillance in all crime location with same energy especially on the streets, residences, Sidewalks and stores
fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'day', title = 'CrimeLoc versus day')
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("Crimeloc_day.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```
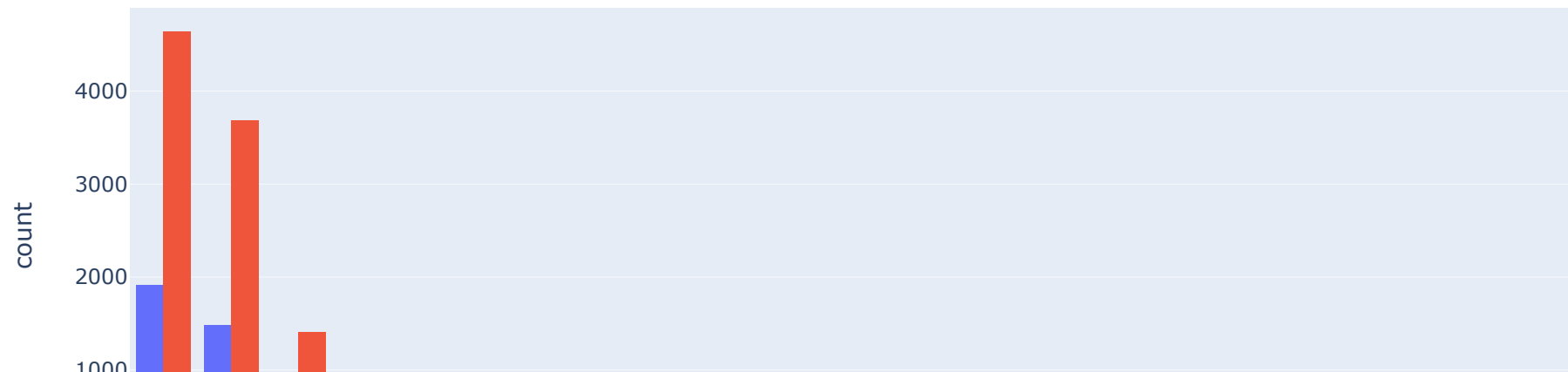
CrimeLoc versus day

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

In [66]:
```python
#More surveillance on the Street, in apartments, on sidewalks and in stores on weekdays than on weekends
fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'dayType', title = 'CrimeLoc versus dayType')
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeLoc_dayType.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```

CrimeLoc versus dayType

In [67]:
```
fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'period', title = 'CrimeLoc versus period')
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

```
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeLoc_period.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```
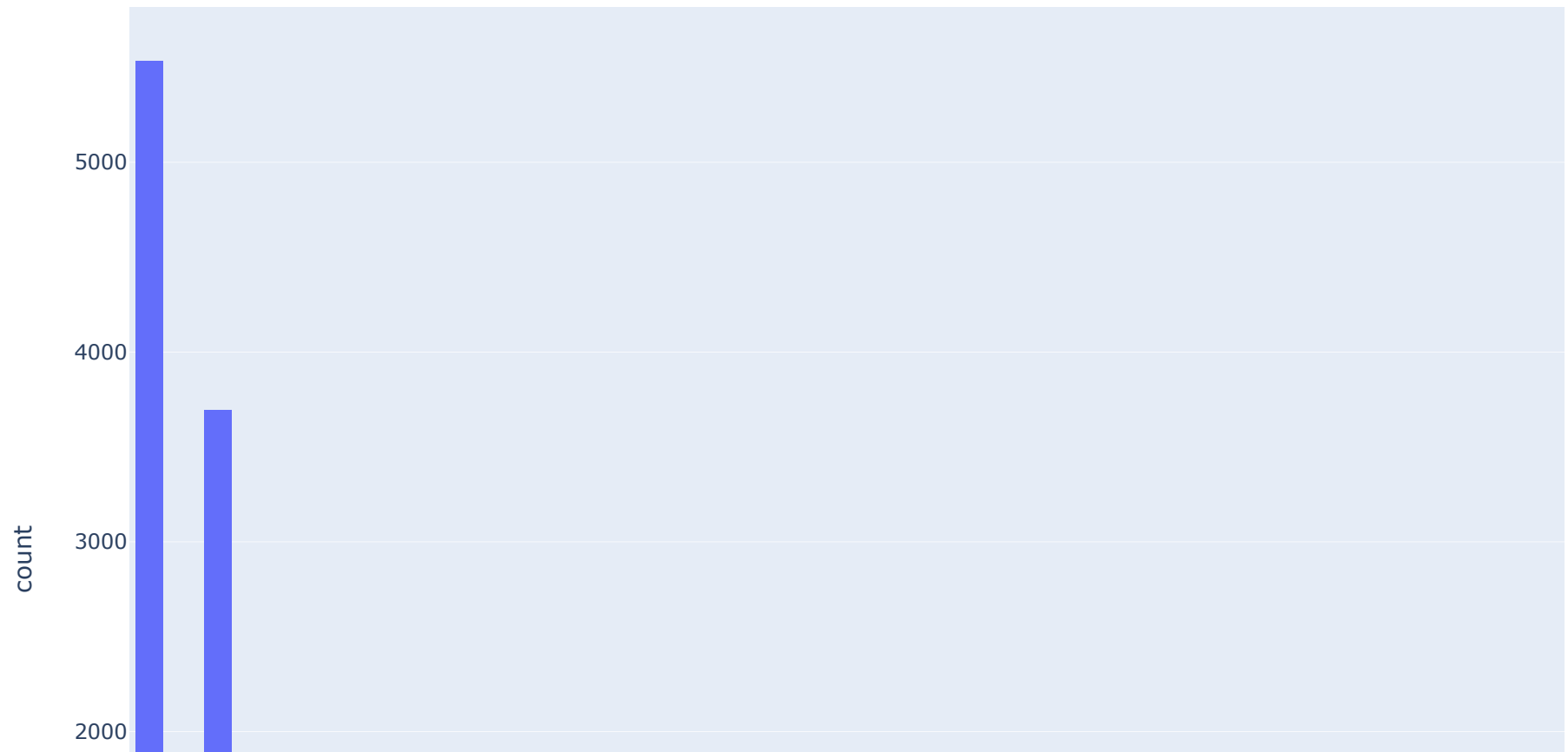
CrimeLoc versus period
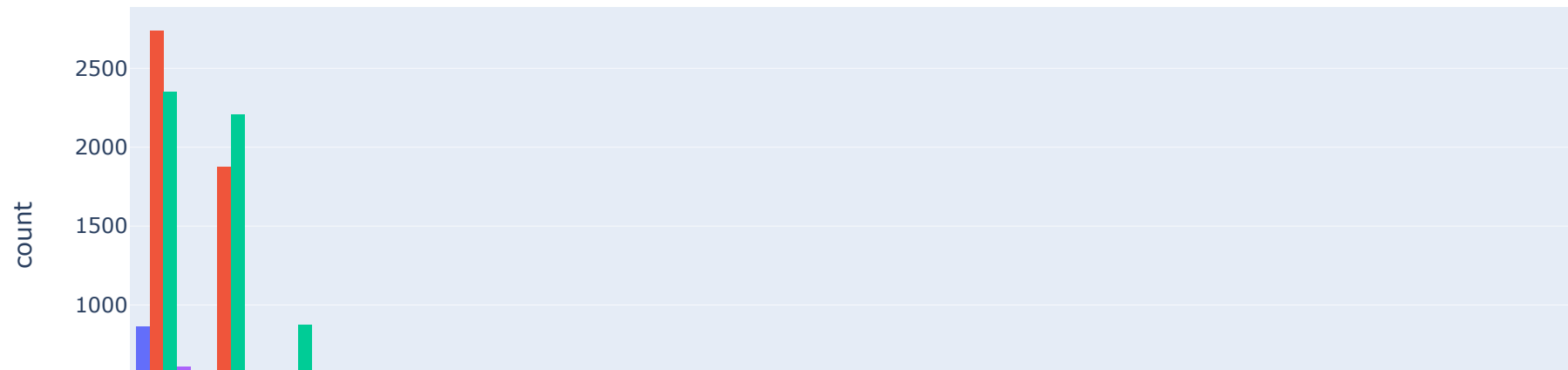

```
In [50]:  #Only criminals found on Sidewalks and in stores are more often than not apprehended.
          #But few of the criminals found in locations like Residences/Apartment, on the streets.
          #More surveillance is needed in these locations.
```
File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js
```
          fig.update_layout(xaxis= { categoryorder :  total descending })
```
`p', title = 'CrimeLoc versus Arrest')`

```python
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeLoc_Arrest.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```

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CrimeLoc versus Arrest

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

In [70]:
```python
fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'month', title = 'CrimeLoc versus month', height= 700,
             category_orders= {"month": ["Jan", "Feb", "Mar", "Apr", "May", "Jun", "Jul", "Aug", "Sep", "Oct", "Nov",
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeLoc_month.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeLoc versus month
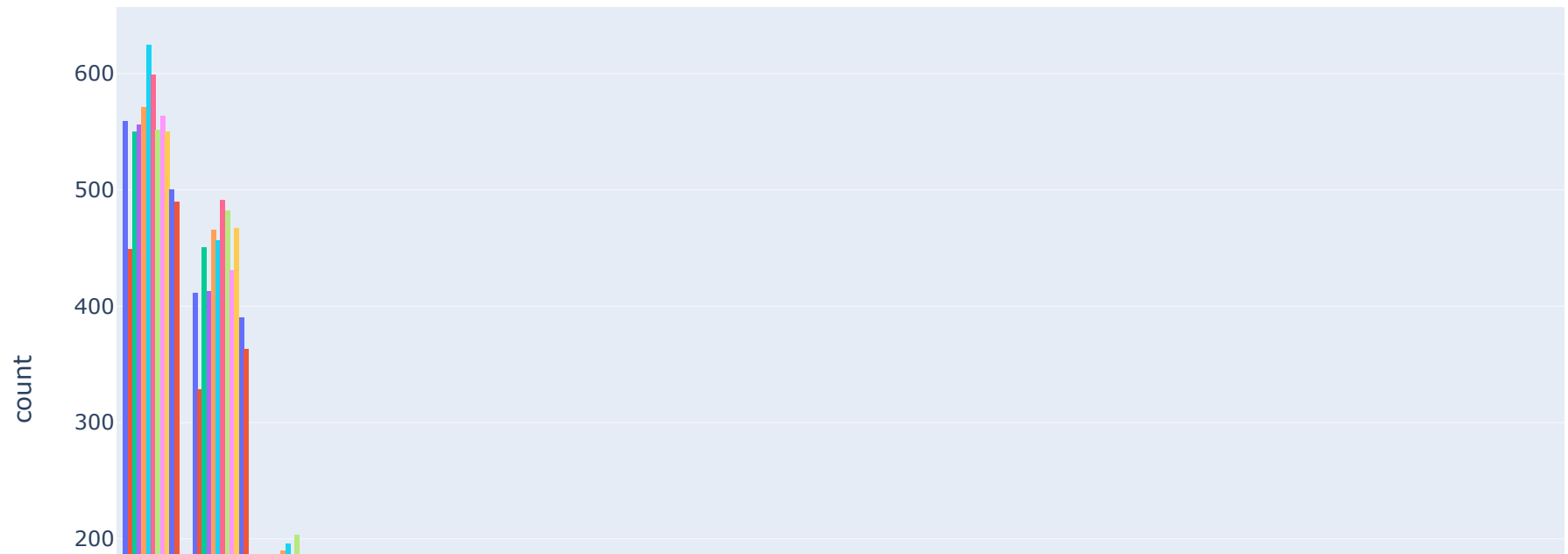
```
In [72]: fig = px.bar(dfFinal, x = 'Year', color = 'Arrest', barmode = 'group', title = 'Arrest versus Year',
                       category_orders ={"Year": ["2001", "2002", "2003", "2004", "2005", "2006", "2007", "2008", "2009", "2010"
         fig.update_traces(dict(marker_line_width=0))
         fig.show()
         with open("Arrest_year.png", 'wb') as f:
             f.write(plt.io.to_image(fig, format='png', scale = 20))
```
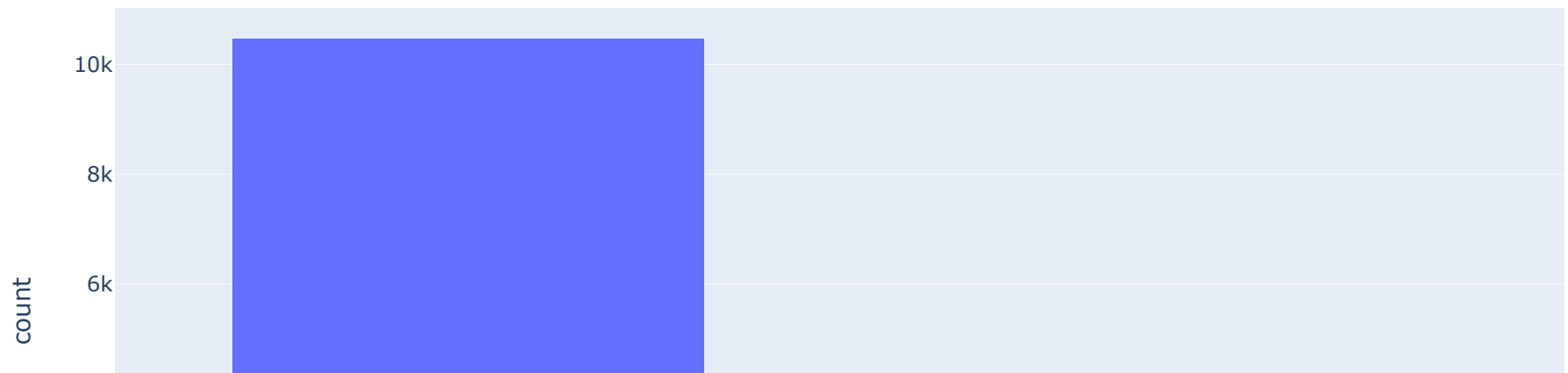
Arrest versus Year
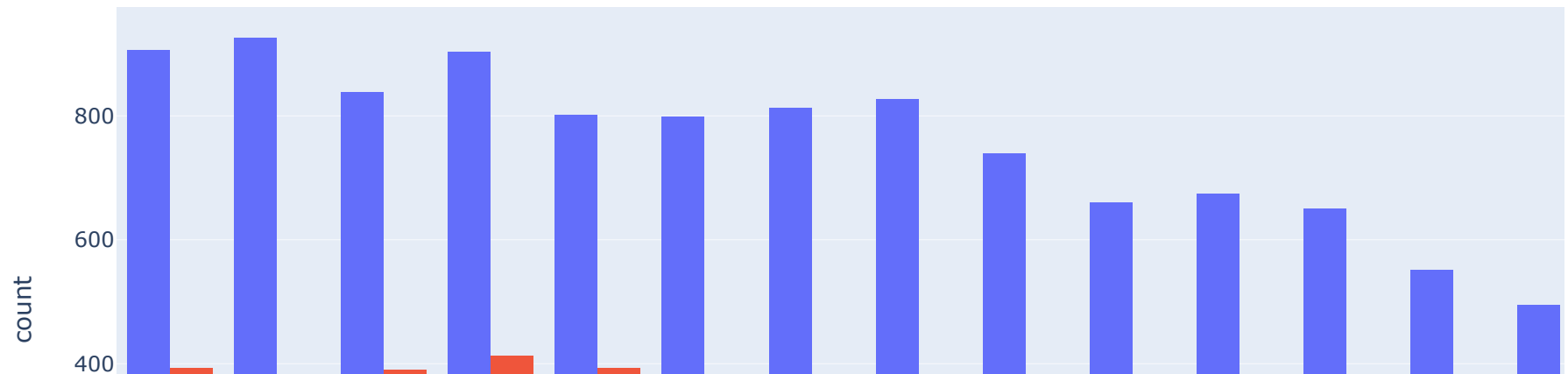

```
In [75]: fig = px.bar(dfFinal, x = 'dayType', color = 'Arrest', title = 'dayType versus Arrest')
```

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```
         fig.update_traces(dict(marker_line_width=0))
```
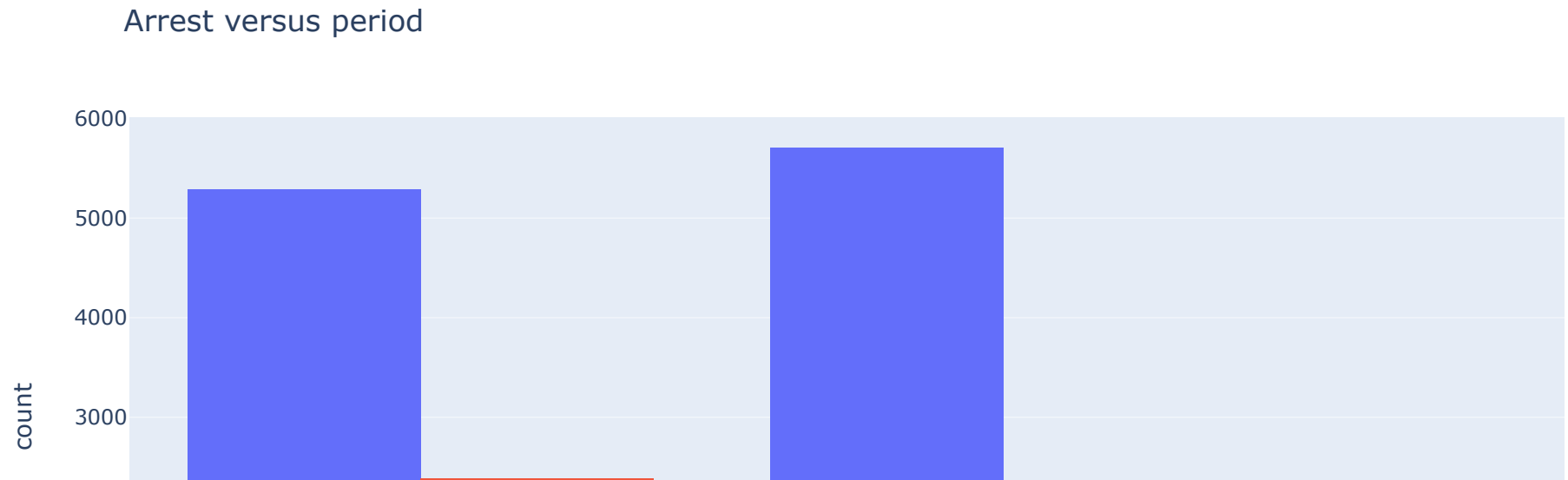
```
fig.show()
with open("dayType_Arrest.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```

dayType versus Arrest


```
In [76]: fig = px.bar(dfFinal, x = 'period', color = 'Arrest', title = 'Arrest versus period')
         fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
         fig.update_traces(dict(marker_line_width=0))
         fig.show()
```

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Arrest versus period

In [78]:
```python
fig = px.bar(dfFinal, x = 'CrimeTyp', color = 'Arrest', title = 'CrimeTyp versus Arrest')
fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
fig.update_traces(dict(marker_line_width=0))
fig.show()
with open("CrimeTyp_Arrest.png", 'wb') as f:
    f.write(plt.io.to_image(fig, format='png', scale = 30))
```

File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeTyp versus Arrest


```
In [79]: fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'Arrest', title = 'CrimeLoc versus Arrest')
         fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
         fig.update_traces(dict(marker_line_width=0))
         fig.show()
         with open("CrimeLoc_Arrest.png", 'wb') as f:
             f.write(plt.io.to_image(fig, format='png',scale = 30))
```
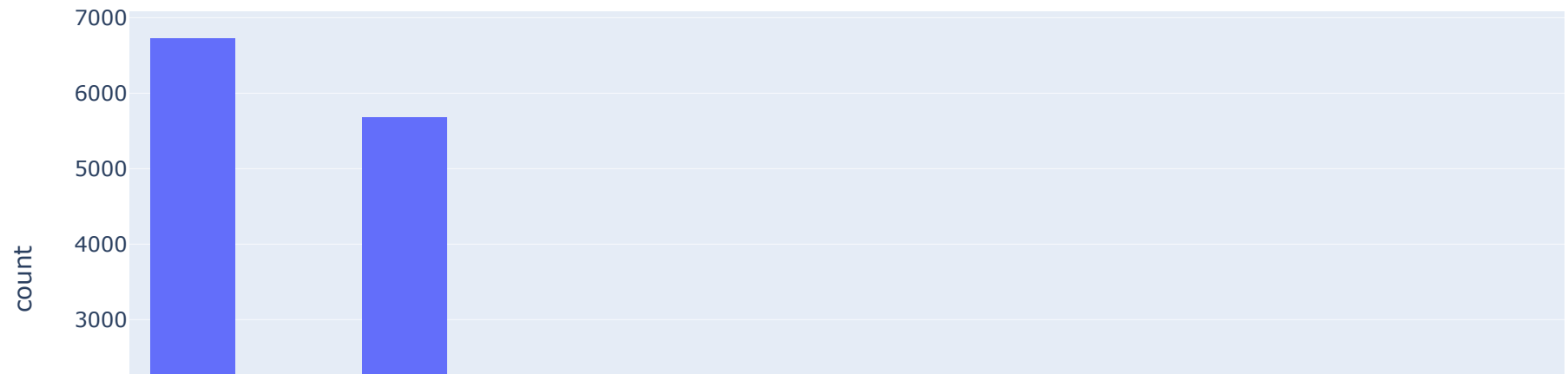
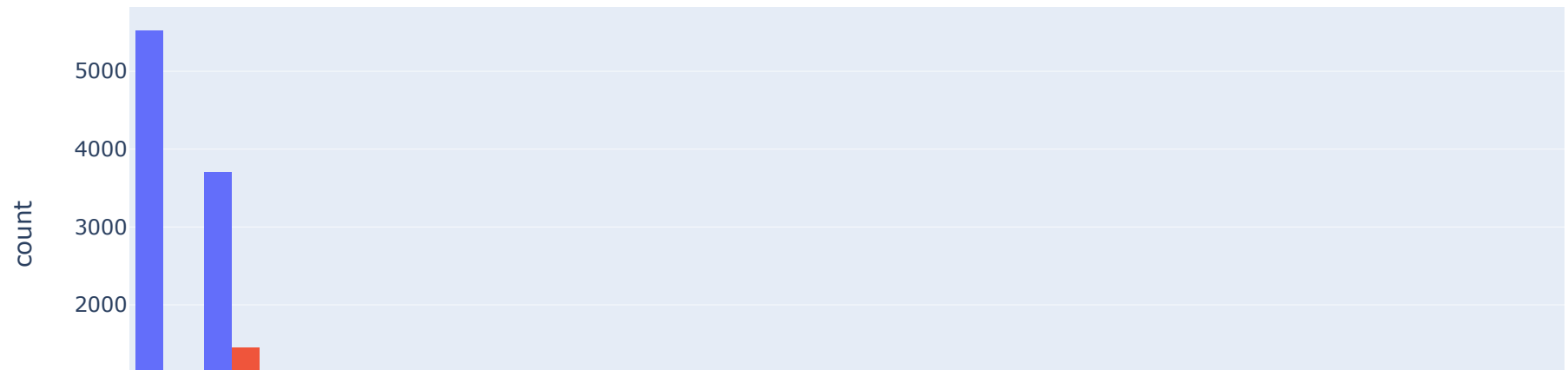File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeLoc versus Arrest


```
In [80]:  fig = px.bar(dfFinal, x = 'CrimeLoc', color = 'Domestic', title = 'CrimeLoc versus Domestic')
          fig.update_layout(barmode = 'group', xaxis= {'categoryorder': 'total descending'})
          fig.update_traces(dict(marker_line_width=0))
          fig.show()
          with open("CrimeLoc_Domestic.png", 'wb') as f:
              f.write(plt.io.to_image(fig, format='png', scale = 30))
```

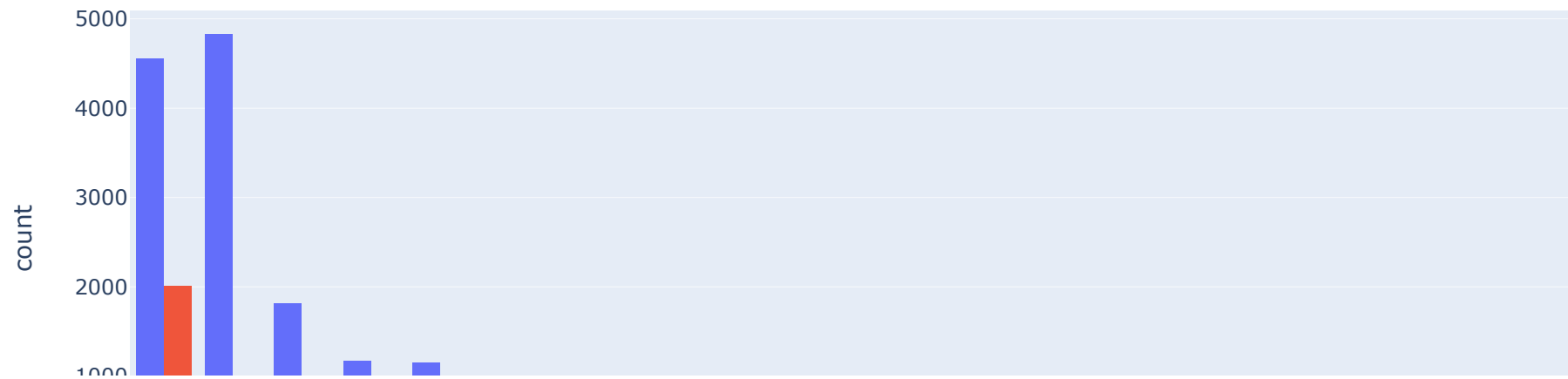File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

CrimeLoc versus Domestic


```
In [82]:   #The number of domestic violence throughout the days of the week are relatively the same
           fig = px.bar(dfFinal, x = 'day', color = 'Domestic', barmode = 'group', title = 'Domestic versus day',
                       category_orders= {"day": ["Mon", "Tue", "Wed", "Thu", "Fri","Sat", "Sun"]})
           fig.update_traces(dict(marker_line_width=0))
           fig.show()
           with open("Domestic_day.png", 'wb') as f:
               f.write(plt.io.to_image(fig, format='png', scale = 30))
```

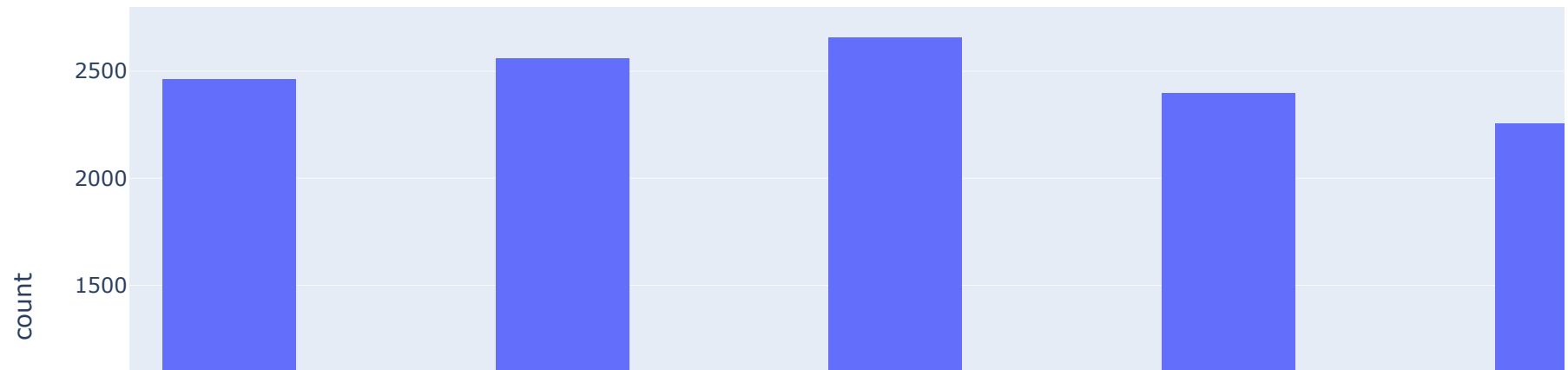File failed to load: https://cdnjs.cloudflare.com/ajax/libs/mathjax/2.7.7/jax/output/CommonHTML/fonts/TeX/fontdata.js

Domestic versus day


```
In [105…   #Bar plot showing the average number of days spent on each crime type
           order = dfFinal.groupby(["District"])["Interval"].mean().sort_values(ascending=False).index
           ax = sns.barplot(x="District", y="Interval",ci = None, data=dfFinal, order=order)
           ax.set_title('AVERAGE NUMBER OF DAYS SPENT ON EACH DISTRICT', fontsize=50)

           sns.set(rc={'figure.figsize':(20,15)})
           '''for p in ax.patches:
               ax.annotate('%{:.1f}'.format(p.get_height()), (p.get_x()+0.1, p.get_height()+50))'''

           for p in ax.patches:
```

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```
    ax.annotate('{:.1f}'.format(p.get_height()), (p.get_x()+0.05, p.get_height()+0.01))


plt.savefig("Interval_xDistrict.jpg")
plt.show()
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
/var/folders/dd/qv07v6216p7bl9jcwjjx54qr0000gn/T/ipykernel_22863/1623244207.py in <module>
     11     ax.annotate('{:.1f}'.format(p.get_height()), (p.get_x()+0.05, p.get_height()+0.01))
     12
---> 13 plt.savefig("Interval_xDistrict.jpg")
     14 plt.show()

/opt/anaconda3/lib/python3.9/site-packages/_plotly_utils/importers.py in __getattr__(import_name)
     37             return getattr(class_module, class_name)
     38
---> 39         raise AttributeError(
     40             "module {__name__!r} has no attribute {name!r}".format(
     41                 name=import_name, __name__=parent_name

AttributeError: module 'plotly' has no attribute 'savefig'
```
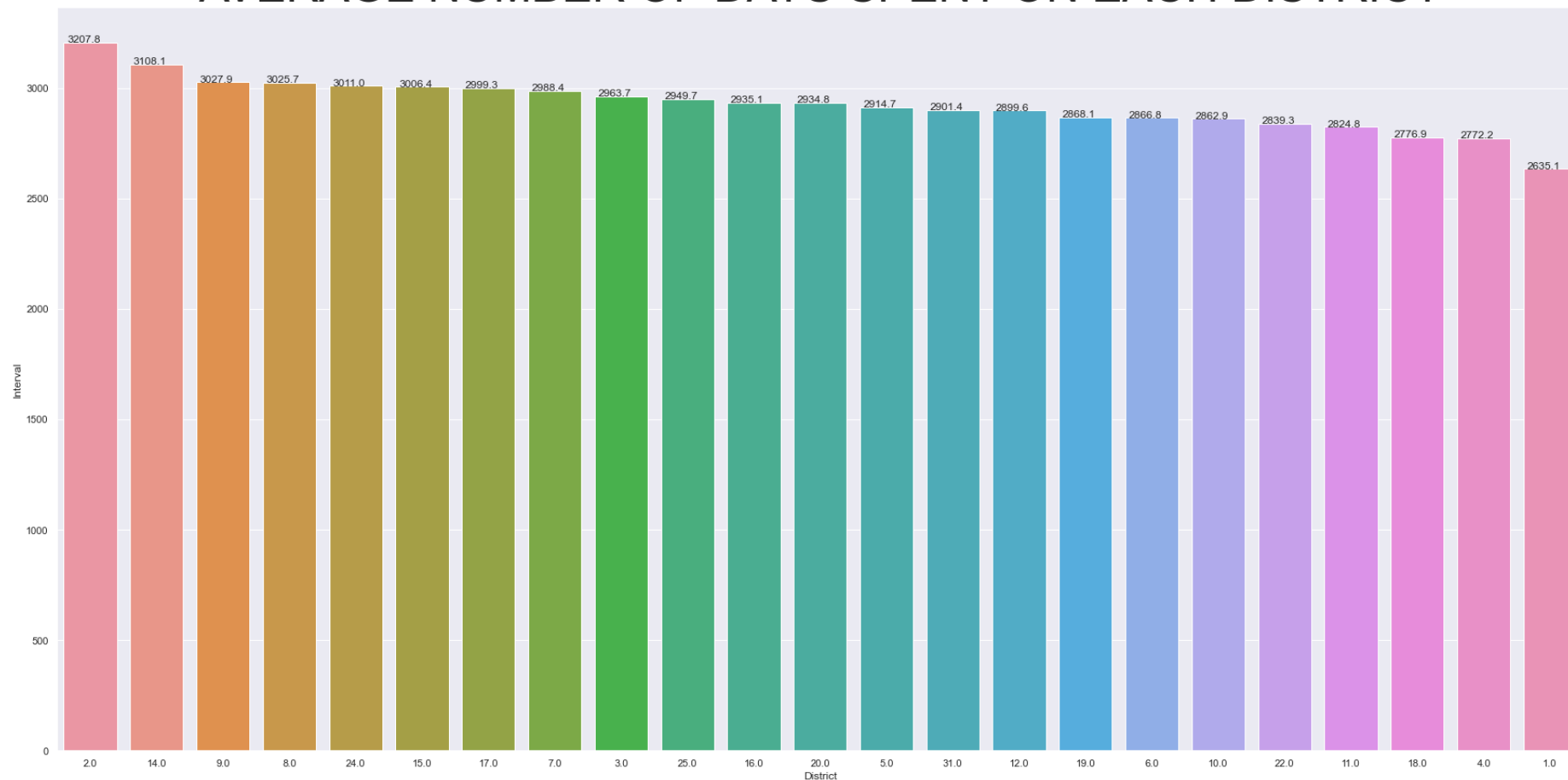
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AVERAGE NUMBER OF DAYS SPENT ON EACH DISTRICT


```
In [106…  #Bar plot showing the average number of days spent on each crime type
          order = dfFinal.groupby(["CrimeTyp"])["Interval"].mean().sort_values(ascending=False).index
          ax = sns.barplot(x="CrimeTyp", y="Interval",ci = None, data=dfFinal, order=order)
          ax.set_title('AVERAGE NUMBER OF DAYS SPENT ON EACH CRIME', fontsize=50)
          sns.set(rc={'figure.figsize':(20,20)})
          '''for p in ax.patches:
                  ax.annotate('%{:.1f}'.format(p.get_height()), (p.get_x()+0.1, p.get_height()+50))'''


          for p in ax.patches:
              ax.annotate('{:.1f}'.format(p.get_height()), (p.get_x()+0.05, p.get_height()+0.01))
          plt xticks(rotation=45)
```

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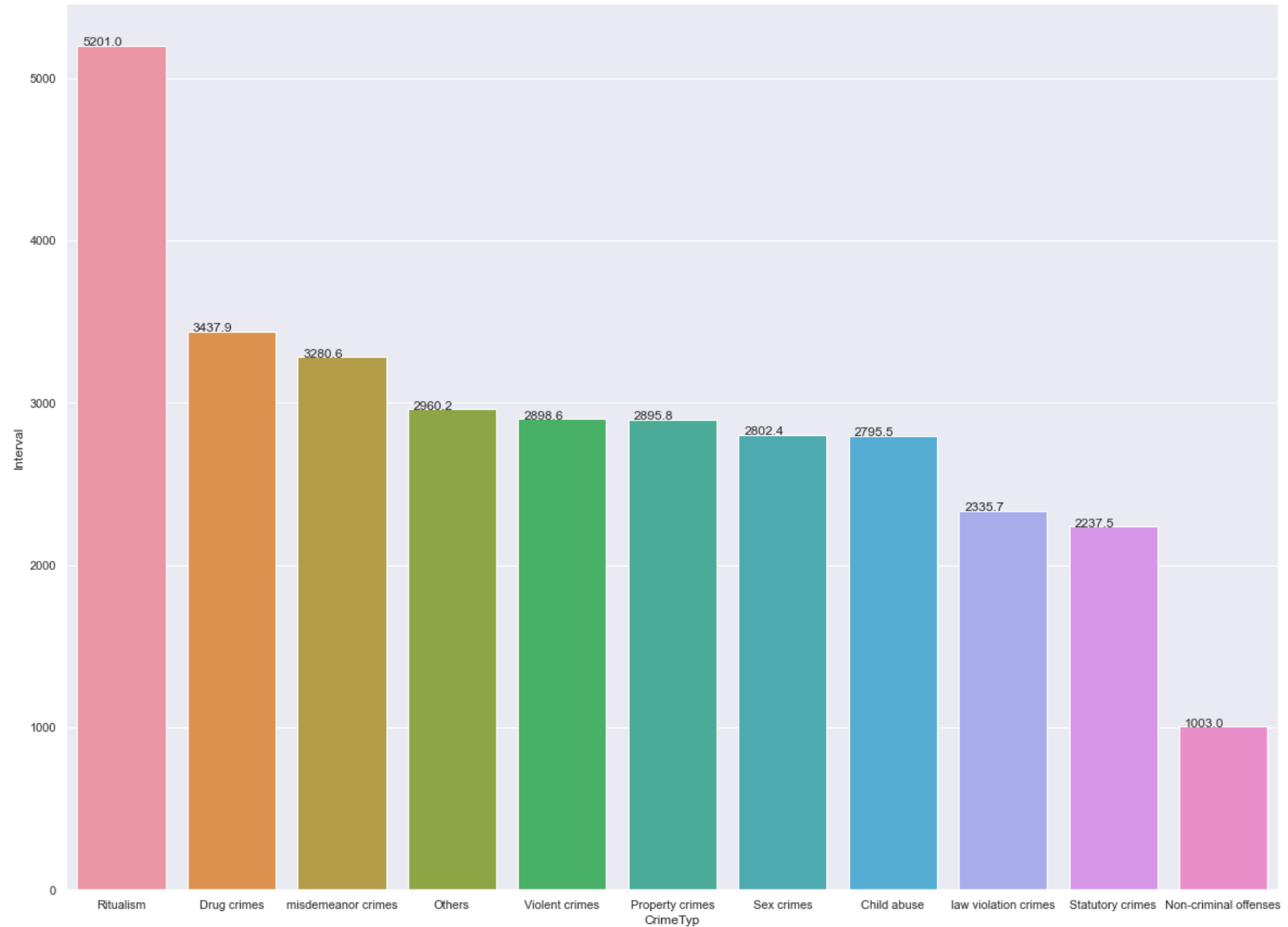
```
plt.savefig("Interval_xCrimeTyp.jpg")
plt.show()
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
/var/folders/dd/qv07v6216p7bl9jcwjjx54qr0000gn/T/ipykernel_22863/1595636049.py in <module>
      9 for p in ax.patches:
     10     ax.annotate('{:.1f}'.format(p.get_height()), (p.get_x()+0.05, p.get_height()+0.01))
---> 11 plt.xticks(rotation=45)
     12 plt.savefig("Interval_xCrimeTyp.jpg")
     13 plt.show()

/opt/anaconda3/lib/python3.9/site-packages/_plotly_utils/importers.py in __getattr__(import_name)
     37                 return getattr(class_module, class_name)
     38
---> 39         raise AttributeError(
     40             "module {__name__!r} has no attribute {name!r}".format(
     41                 name=import_name, __name__=parent_name

AttributeError: module 'plotly' has no attribute 'xticks'
```

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AVERAGE NUMBER OF DAYS SPENT ON EACH CRIME


```
In [107…   #With the code:
```

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#The following blocks (with number of reported crimes) should be under more serious surveillance!.

```
'''001XX N STATE ST 51
100XX W OHARE ST 33
008XX N MICHIGAN AVE 28
076XX S CICERO AVE 25
063XX S DR MARTIN LUTHER KING JR DR 21
0000X W TERMINAL ST 19
023XX S STATE ST 17
001XX W 87TH ST 17
0000X N STATE ST 17
075XX S STONY ISLAND AVE 16
064XX S DR MARTIN LUTHER KING JR DR 16
005XX E BROWNING AVE 15
0000X E GRAND AVE 15
006XX N MICHIGAN AVE 15
012XX S WABASH AVE 15
0000X S STATE ST 14
065XX S DR MARTIN LUTHER KING JR DR 13
023XX W MADISON ST 13
057XX S CICERO AVE 13
021XX E 87TH ST 13
006XX N CLARK ST 13
002XX W 87TH ST 12
001XX W DIVISION ST 12
033XX N HALSTED ST 12
039XX W VAN BUREN ST 12
009XX W BELMONT AVE 12
066XX S HALSTED ST 11
086XX S COTTAGE GROVE AVE 11
003XX N CENTRAL AVE 11
005XX N MICHIGAN AVE 11
011XX S CANAL ST 11
040XX W LAKE ST 11
015XX N MILWAUKEE AVE 11
017XX W HOWARD ST 11
063XX S ASHLAND AVE 10
006XX E GRAND AVE 10
0000X W JACKSON BLVD 10
012XX N CLARK ST 10
022XX S STATE ST 10
012XX N LARRABEE ST 10
```

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```
008XX N STATE ST 10
```

```
048XX W NORTH AVE 10
024XX S STATE ST 10
0000X W DIVISION ST 10
015XX S KEELER AVE 10
'''
```

Out[107]: '001XX N STATE ST 51\n100XX W OHARE ST 33 \n008XX N MICHIGAN AVE 28 \n076XX S CICERO AVE 25\n063XX S DR MARTIN LUTHER KING JR DR 21\n0000X W TERMINAL ST 19 \n023XX S STATE ST 17 \n001XX W 87TH ST 17 \n0000X N STATE ST 17 \n075XX S STONY ISLAND AVE 16 \n064XX S DR MARTIN LUTHER KING JR DR 16 \n005XX E BROWNING AVE 15 \n0000X E GRAND AVE 15 \n006XX N MICHIGAN AVE 15 \n012XX S WABASH AVE 15 \n0000X S STATE ST 14 \n065XX S DR MARTIN LUTHER KING JR DR 13\n023XX W MADISON ST 13\n057XX S CICERO AVE 13\n021XX E 87TH ST 13 \n006XX N CLARK ST 13 \n002XX W 87TH ST 12 \n001XX W DIVISION ST 12\n033XX N HALSTED ST 12 \n039XX W VAN BUREN ST 12 \n009XX W BELMONT AVE 12 \n066XX S HALSTED ST 11 \n086XX S COTTAGE GROVE AVE 11 \n003XX N CENTRAL AVE 11 \n005XX N MICHIGAN AVE 11 \n011XX S CANAL ST 11 \n040XX W LAKE ST 11 \n015XX N MILWAUKEE AVE 11\n017XX W HOWARD ST 11 \n063XX S ASHLAND AVE 10 \n006XX E GRAND AVE 10 \n0000X W JACKSON BLVD 10\n012XX N CLARK ST 10 \n022XX S STATE ST 10 \n012XX N LARRABEE ST 10 \n012XX S ASHLAND AVE 10 \n008XX N STATE ST 10 \n048XX W NORTH AVE 10 \n024XX S STATE ST 10 \n0000X W DIVISION ST 10 \n015XX S KEELER AVE 10\n'

In [91]:
```
'''Most common crimes are property, violent, drug, statutory and misdemeanor crimes.
The police authority should prepare for these crimes
in residences/apartments, sidewalks, on the streets, in stores all day round,
in the mornings and nights (within the hours of 00:00 am till 11:59 am and from 17:00pm till 23:59 pm)
and slightly lower crime rates on weekends
(with the exception of violent crimes which is slightly higher on weekends).
Drug crimes surveillance must increase at night.

These crimes happen all month round and it's at its peak in the months
of May, June, July, August, September and October (for violent and property crimes).
More crime surveillance must be made at the beginning of each year.

To arrest criminals, The police officials must target the following locations:
Residences/apartments, streets, sidewalks and in stores. More arrests were made on sidewalks and in stores.
More attention should be focused or more frequent crime locations like in Residences/apartments and on the streets.

More police officers need to be recruited (If they are lacking or more patrol units need to be designated)
to increase arrest rates from 26.5% to about 50% or even more.
Arrest rate is beginning to diminish over the years.
Whatever measures that were made in arresting criminals need to be revisited.

All drug criminals were arrested, more arrests need to be made for other more
```

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```
More arrests needed in the mornings when crime rate is higher other than at nights.
Follow up investigation was made on much less frequent crimes like 'Ritualism' and 'misdemeanor crimes'.

More investigation time needs to be spent on violent and property crimes.

Follow-up investigation is made on each district almost on the same frequency.
Whereas, more time needs to be spent on the following districts
with higher crime rates 8, 11, 6, 7, 4, 25, 9, 3, 12, 2, 19, 10, 18, 15, 5, 1 than on 22, 16, 24, 17, 20,
and 31 with much lesser crime rates.



'''
```

Out[91]: 'Most common crimes are property, violent, drug, statutory and misdemeanor crimes. \nThe police authority should prepare for these crimes in residences/apartments, sidewalks, on the streets, \nin stores all day round (with higher rates during the week) in the mornings and nights \n(within the hours of 00:00 am till 11:59 am and from 17:00pm till 23:59 pm) \nand lower crime rates on sundays (with the exception of violent crimes which is higher on weekends). \nDrug crimes surveillance can span from 00:00 am till 23:29 pm. These crimes happen all month round and it's at its peak in the months of May, June July, August, September and October (for violent and property crimes). However, drug crimes were observed more at the beginning of the year.\n'

In [ ]:

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