Murders

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import matplotlib
from matplotlib import cm
import seaborn as sns
from plotly.offline import download_plotlyjs, init_notebook_mode, plot, iplot
init_notebook_mode(connected=True)
import plotly.graph_objects as go

from IPython.display import HTML,display
import warnings
warnings.filterwarnings("ignore")

import os
for dirname, _, filenames in os.walk('/content/drive/MyDrive/Data visualozation/Crime'):
    for filename in filenames:
        print(os.path.join(dirname, filename))
```

```
/content/drive/MyDrive/Data visualozation/Crime/Auto_theft.csv
/content/drive/MyDrive/Data visualozation/Crime/Complaints_against_police.csv
/content/drive/MyDrive/Data visualozation/Crime/Property_stolen_and_recovered.csv
/content/drive/MyDrive/Data visualozation/Crime/Rape_Victims.csv
/content/drive/MyDrive/Data visualozation/Crime/Murders.csv
/content/drive/MyDrive/Data visualozation/Crime/Murged_data/output1.csv
/content/drive/MyDrive/Data visualozation/Crime/Murged_data/output2.csv
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India States/Indian_states.prj
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India States/Indian_states.shp
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India States/Indian_states.dbf
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India States/Indian_states.shx
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India Boundary/India_boundary.shx
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India Boundary/India_boundary.prj
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India Boundary/India_boundary.shp
/content/drive/MyDrive/Data visualozation/Crime/Indian map/India Boundary/India_boundary.dbf
```

Introduction

Murder is the top most category of crime in India. Currently India's homicide rate is 3.08 per 100,000 population. The objective of this notebook is to see the trend of murder victims over the years as well as murder victims per state. first lets see the data.

```
murder = pd.read_csv("/content/drive/MyDrive/Data visualozation/Crime/Murders.csv")
murder.Year.unique()
murder.Area_Name.unique()
murder.Sub_Group_Name.unique()
murder.head(10)
```

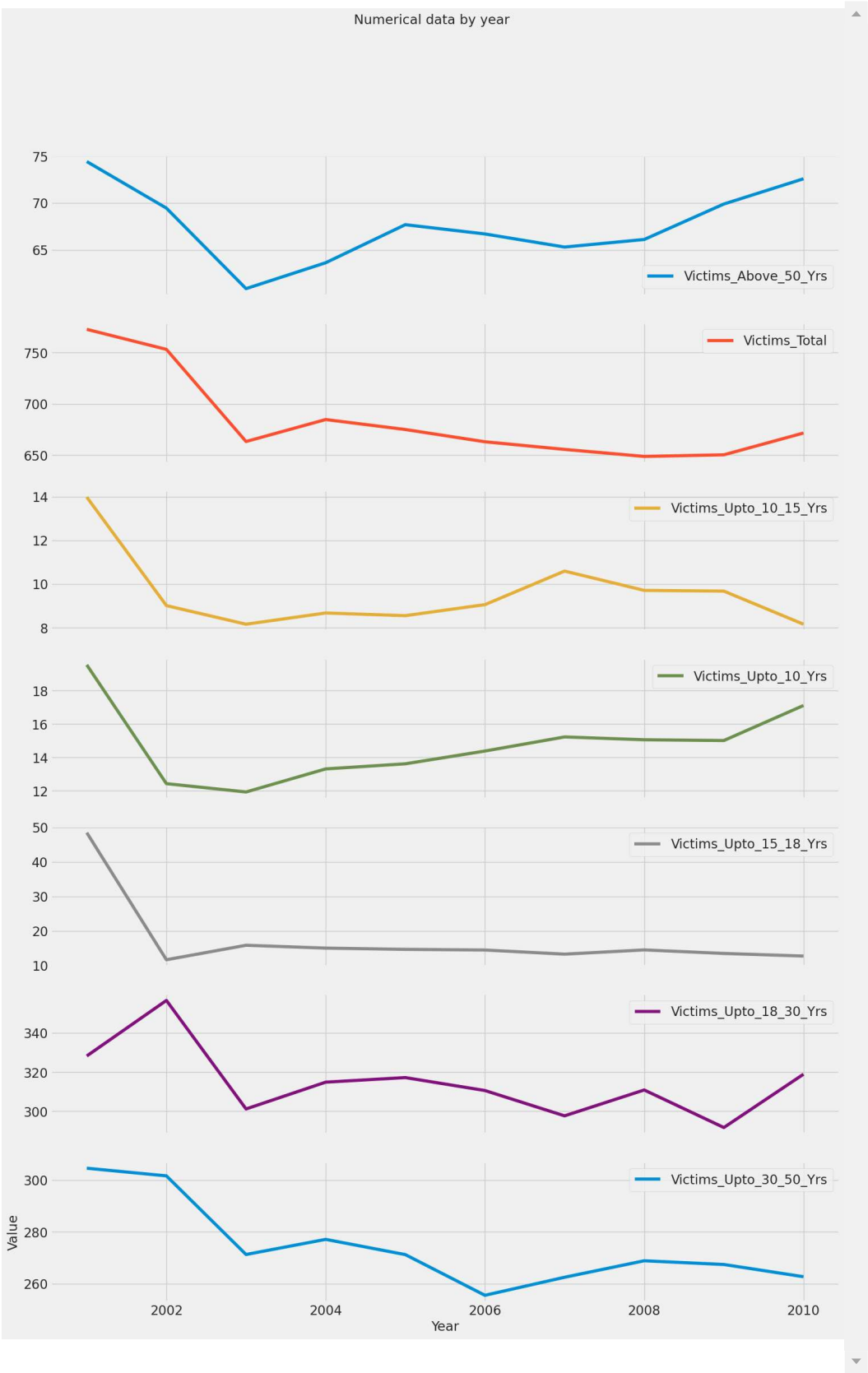
	Area_Name	Year	Group_Name	Sub_Group_Name	Victims_Above_50_Yrs	Victims_Total	Victims_Upto_10_1
0	Andaman & Nicobar Islands	2001	Murder - Female Victims	2. Female Victims	NaN	6	
1	Andhra Pradesh	2001	Murder - Female Victims	2. Female Victims	67.0	607	
2	Arunachal Pradesh	2001	Murder - Female Victims	2. Female Victims	2.0	16	
3	Assam	2001	Murder - Female Victims	2. Female Victims	11.0	128	
4	Bihar	2001	Murder - Female Victims	2. Female Victims	12.0	366	
5	Chandigarh	2001	Murder - Female Victims	2. Female Victims	3.0	5	
6	Chhattisgarh	2001	Murder - Female Victims	2. Female Victims	63.0	549	

```
import pandas as pd
import matplotlib.pyplot as plt
# Group the data by year and calculate the mean of each numerical column
grouped = murder.groupby('Year').mean()

# Plot each numerical column in the same plot
grouped.plot(kind='line', subplots=True, figsize=(16, 25))

# Set the plot title and labels
plt.suptitle('Numerical data by year')
plt.xlabel('Year')
plt.ylabel('Value')

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


Numerical data by year
Victims_Above_50_Yrs
Victims_Total
Victims_Upto_10_15_Yrs
Victims_Upto_10_Yrs
Victims_Upto_15_18_Yrs
Victims_Upto_18_30_Yrs
Victims_Upto_30_50_Yrs
Value
Year
2002
2004
2006
2008
2010

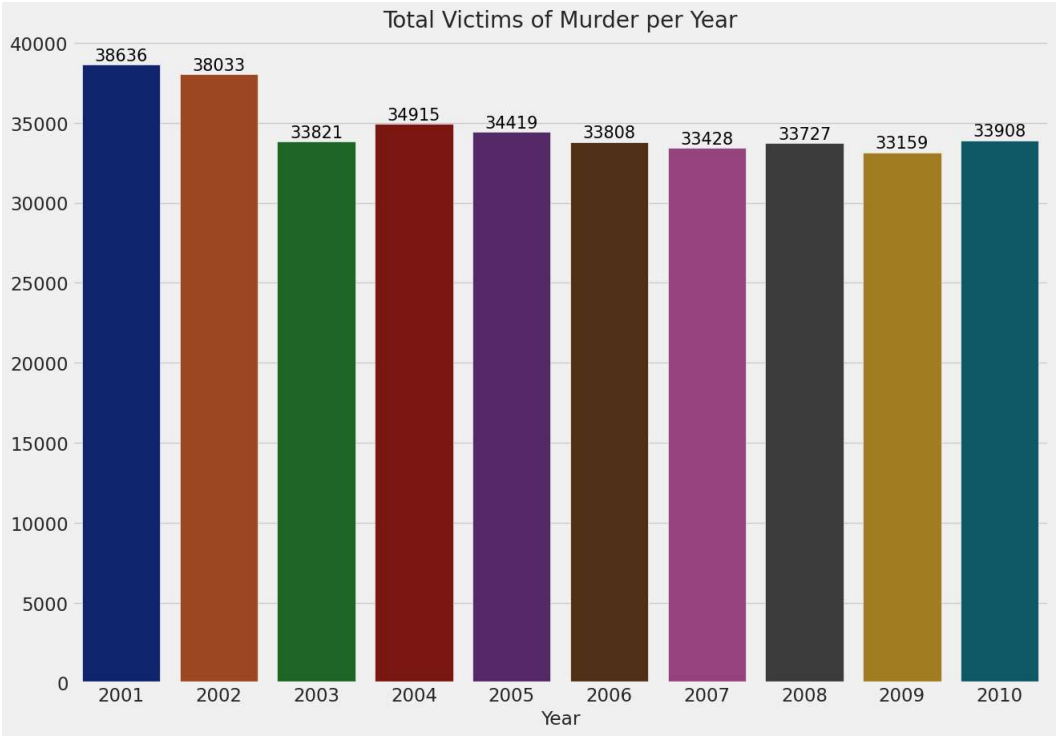
This dataset contains Victim's information from year 2001 to 2010 and 35 states & Union territories. The age group is divided into 6 categories.

- less than 10 year old victims
- 10-15 year old victims
- 15-18 year old victims
- 18-30 year old victims
- 30-50 year old victims
- 50 + older victims

```
from IPython.core.display import HTML
HTML('''<div class="flourish-embed flourish-bar-chart-race" data-src="visualisation/2693755" data-url="https://flo.uri.sh/visualisation/26937
```

Murder Victims Per Year

```
murdert = murder[murder['Sub_Group_Name']== '3. Total']  #keeping only total category of subgroup
murdery = murdert.groupby(['Year'])['Victims_Total'].sum().reset_index() #grouping
sns.set_context("talk")
plt.style.use("fivethirtyeight")
plt.figure(figsize = (14,10))
#sns.palplot(sns.color_palette("hls", 8))
ax = sns.barplot(x = 'Year' , y = 'Victims_Total' , data = murdery ,palette= 'dark') #plotting bar graph
plt.title("Total Victims of Murder per Year")
ax.set_ylabel('')
for p in ax.patches:
             ax.annotate("%.f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()),
                 ha='center', va='center', fontsize=15, color='black', xytext=(0, 8),
                 textcoords='offset points')
```



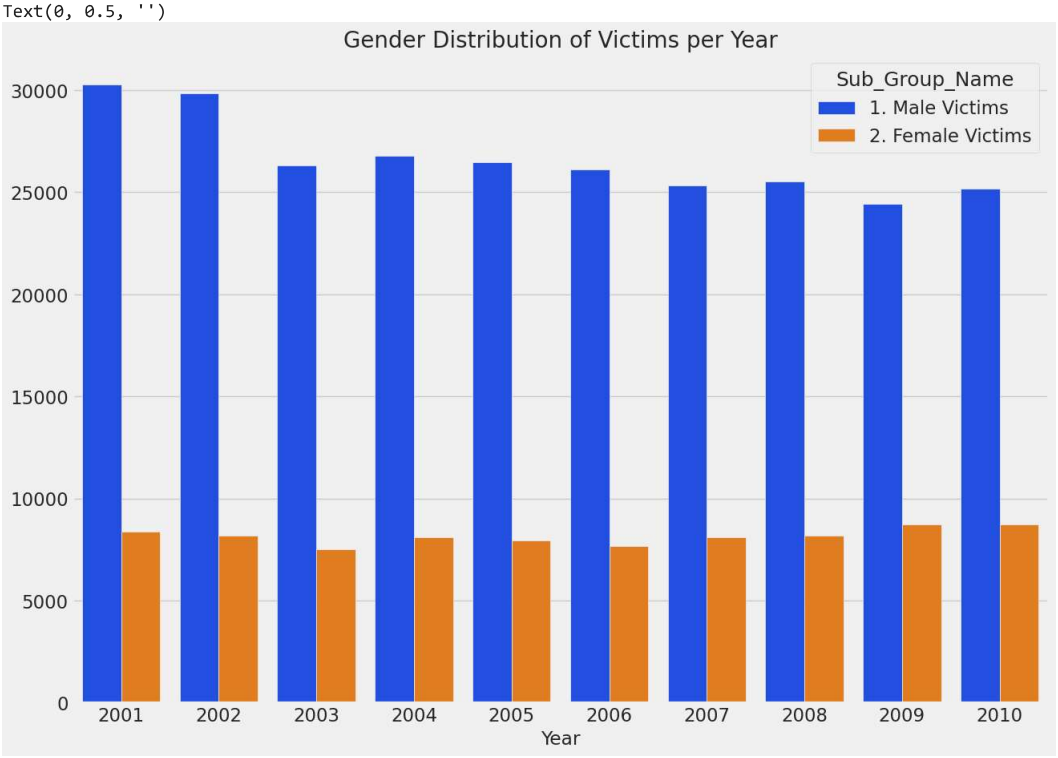
Inference : We can see that the no. of victims is gradually decresing over the years.

Gender of the victims

```
murderg = murder.groupby(['Year' , 'Sub_Group_Name'])['Victims_Total'].sum().reset_index() # grouping with year and sub group
murderg = murderg[murderg['Sub_Group_Name']!= '3. Total']   # we dont need total category of sub group

plt.style.use("fivethirtyeight")
plt.figure(figsize = (14,10))
ax = sns.barplot( x = 'Year', y = 'Victims_Total' , hue = 'Sub_Group_Name' , data = murderg ,palette= 'bright') #plotting barplot
plt.title('Gender Distribution of Victims per Year',size = 20)
ax.set_ylabel('')
```

```
Text(0, 0.5, '')
```



Inference: Males are more prone to be murder victim as compared to women . Over the years the number of male victims has decreased but the number of female victims is almost same as the previous years.

Age of the victim

```
murdera = murder.groupby(['Year'])['Victims_Upto_10_15_Yrs','Victims_Above_50_Yrs',
                                   'Victims_Upto_10_Yrs', 'Victims_Upto_15_18_Yrs',
                                   'Victims_Upto_18_30_Yrs','Victims_Upto_30_50_Yrs',].sum().reset_index()  #grouby year and age group
murdera = murdera.melt('Year', var_name='AgeGroup',  value_name='vals') #melting the dataset

plt.style.use("fivethirtyeight")
plt.figure(figsize = (14,10))
ax = sns.barplot(x = 'Year' , y = 'vals',hue = 'AgeGroup' ,data = murdera ,palette= 'bright') #plotting a bar
plt.title('Age Distribution of Victims per Year',size = 20)
ax.get_legend().set_bbox_to_anchor((1, 1)) #anchoring the labels so that they dont show up on the graph
ax.set_ylabel('')
```

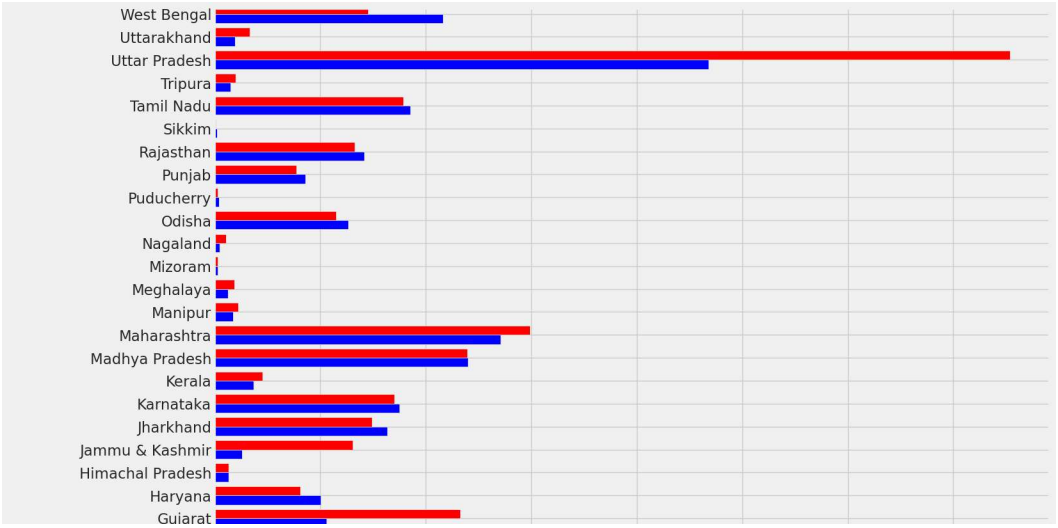
```
Text(0, 0.5, '')
```


```
vic_murd_2002_total = murder[(murder['Year']==2002) & (murder['Sub_Group_Name']== '3. Total')]
vic_murd_2009_total = murder[(murder['Year']==2009) & (murder['Sub_Group_Name']== '3. Total')]
df1 = vic_murd_2002_total[['Area_Name','Victims_Total']]
df2 = vic_murd_2009_total[['Area_Name','Victims_Total']]
df1 ['Total no of murder victims (2002)'] = df1 ['Victims_Total']
df2 ['Total no of murder victims (2009)'] = df2 ['Victims_Total']
df1.drop(['Victims_Total'], axis = 1, inplace = True)
df2.drop(['Victims_Total'], axis = 1, inplace = True)
fig = plt.figure()
ax = fig.add_subplot(111) # Create matplotlib axes

width = 0.4

df1.plot(kind='barh', color='red', ax=ax, width=width, position=0,figsize=(15,15))
df2.plot(kind='barh', color='blue', ax=ax, width=width, position=1,figsize=(15,15))
ax.set_xlabel("Number of Victims", fontsize=15)
ax.set_yticklabels(df1['Area_Name'])

plt.show()
```



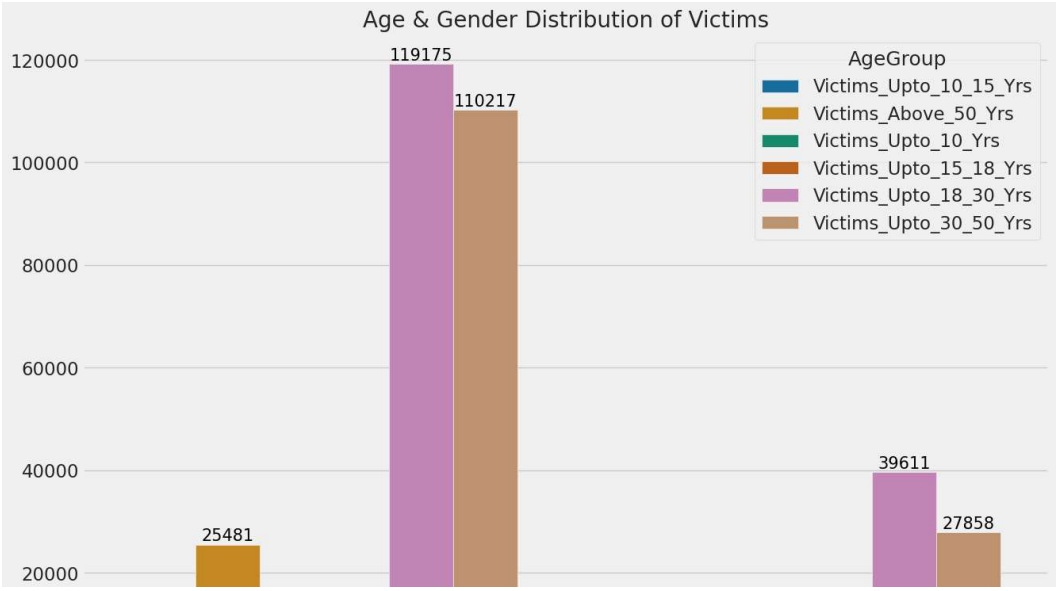
Inference: Compared to people of other ages the age group 18 - 30 years is more prone to be victim of the murder. The rise in 2002 numbers is **maybe** due to the riots of gujrat . Another age group which is most likely to be victim of murder is 30 - 50. Compared to these two groups other age groups are very small in number. From all the groups children are most likely to be safe.

Age & Gender of the victim


```
murderag = murder.groupby(['Sub_Group_Name'])['Victims_Upto_10_15_Yrs',
                                              'Victims_Above_50_Yrs', 'Victims_Upto_10_Yrs',
                                              'Victims_Upto_15_18_Yrs','Victims_Upto_18_30_Yrs',
                                              'Victims_Upto_30_50_Yrs',].sum().reset_index()       #grouping with the gender and age groups

murderag = murderag.melt('Sub_Group_Name', var_name='AgeGroup',  value_name='vals')  #melting the dataset for drawing the desired plot
murderag= murderag[murderag['Sub_Group_Name']!= '3. Total']

plt.style.use("fivethirtyeight")
plt.figure(figsize = (14,10))
ax = sns.barplot(x = 'Sub_Group_Name' , y = 'vals',hue = 'AgeGroup' ,data = murderag,palette= 'colorblind') #making barplot taking Agegroup a
plt.title('Age & Gender Distribution of Victims',size = 20)
ax.get_legend().set_bbox_to_anchor((1, 1)) #using anchor so that legend doesnt show on the graph
ax.set_ylabel('')
ax.set_xlabel('Victims Gender')
for p in ax.patches:
             ax.annotate("%.f" % p.get_height(), (p.get_x() + p.get_width() / 2., p.get_height()),
                 ha='center', va='center', fontsize=15, color='black', xytext=(0, 8),
                 textcoords='offset points')
```



Inference: Males of age 18-30 are more likely to be get killed as compared to the any of the age-gender group. After them male of 30-50 are prone to be victim of murder. Similar to male age groups females of age 18-30 are more likely to be get killed .

Murders: Statewise

```
murderst = murder[murder['Sub_Group_Name']== '3. Total']   #we need only total number of victims per state
murderst= murderst.groupby(['Area_Name'])['Victims_Total'].sum().sort_values(ascending = False).reset_index()
new_row = {'Area_Name':'Telangana', 'Victims_Total':27481}
murderst = murderst.append(new_row , ignore_index=True )
murderst.sort_values('Area_Name')
import geopandas as gpd
gdf = gpd.read_file('/content/drive/MyDrive/Data visualozation/Crime/Indian map/India States/Indian_states.shp')
murderst.at[17, 'Area_Name'] = 'NCT of Delhi'
merged = gdf.merge(murderst, left_on='st_nm', right_on='Area_Name')
merged.drop(['Area_Name'], axis=1)
#merged.describe()
```

	st_nm	geometry	Victims_Total
0	Assam	MULTIPOLYGON (((89.74323 26.30362, 89.74290 26...	12761
1	Bihar	MULTIPOLYGON (((84.50720 24.26323, 84.50355 24...	34675
2	Chandigarh	POLYGON ((76.84147 30.75996, 76.83599 30.73623...	202
3	Chhattisgarh	POLYGON ((83.33532 24.09885, 83.35346 24.09627...	10787
4	Daman & Diu	MULTIPOLYGON (((72.89335 20.44539, 72.89281 20...	53
5	Goa	MULTIPOLYGON (((74.11918 14.75344, 74.11350 14...	412
6	Gujarat	MULTIPOLYGON (((71.70375 20.99958, 71.70375 20...	12757
7	Haryana	POLYGON ((76.85065 30.87512, 76.86594 30.86691...	8793
8	Himachal Pradesh	POLYGON ((76.79634 33.25490, 76.80351 33.25275...	1269
9	Jammu & Kashmir	POLYGON ((74.73451 37.02068, 74.73647 37.01937...	7339
10	Jharkhand	POLYGON ((87.60582 25.31512, 87.61279 25.31184...	15682
11	Karnataka	MULTIPOLYGON (((74.69694 13.32782, 74.69562 13...	16891
12	Kerala	POLYGON ((74.99575 12.79227, 75.00006 12.78777...	4208
13	Lakshadweep	MULTIPOLYGON (((74.10131 11.20431, 74.09908 11...	4

```
merged['coords'] = merged['geometry'].apply(lambda x: x.representative_point().coords[:])
merged['coords'] = [coords[0] for coords in merged['coords']]
```

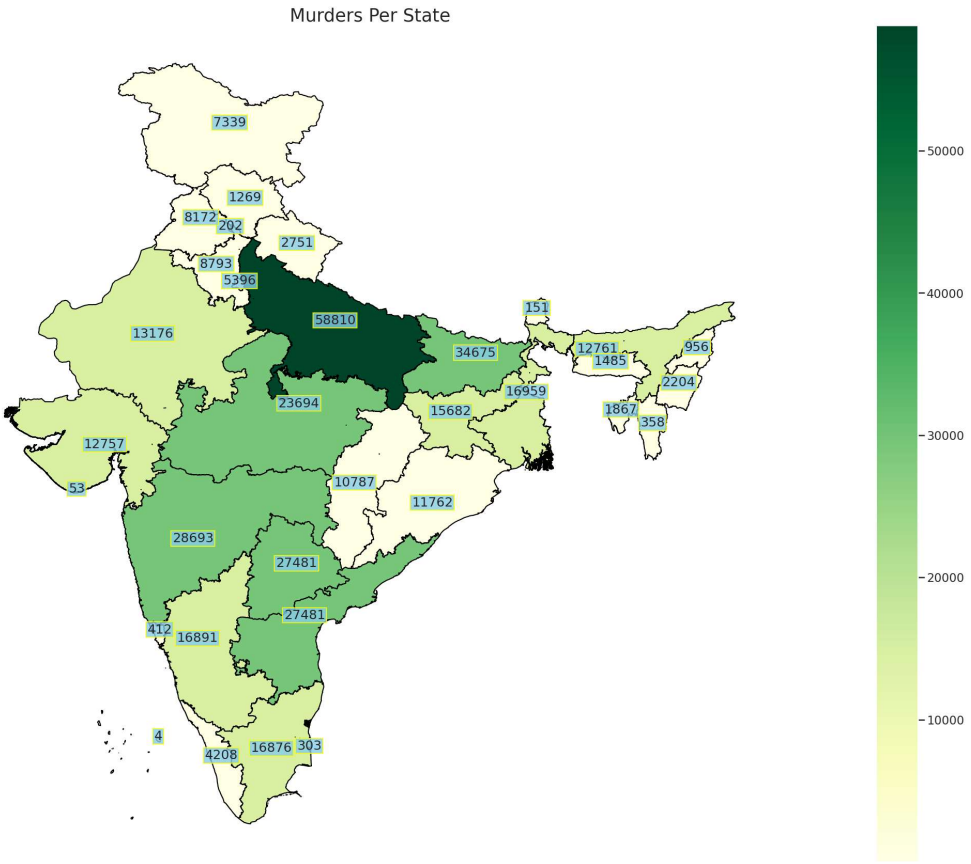
```
sns.set_context("talk")
sns.set_style("dark")
#plt.style.use('dark_background')
cmap = 'YlGn'
figsize = (25, 20)

ax = merged.dropna().plot(column= 'Victims_Total', cmap=cmap, figsize=figsize, scheme='equal_interval',edgecolor='black')


for idx, row in merged.iterrows():
   ax.text(row.coords[0], row.coords[1], s=row['Victims_Total'], horizontalalignment='center', bbox={'facecolor': 'skyblue', 'alpha':0.8, 'pa


ax.set_title("Murders Per State", size = 25)

norm = matplotlib.colors.Normalize(vmin=merged['Victims_Total'].min(), vmax= merged['Victims_Total'].max())
n_cmap = cm.ScalarMappable(norm=norm, cmap= cmap)
n_cmap.set_array([])
ax.get_figure().colorbar(n_cmap)
ax.set_axis_off()
plt.axis('equal')
plt.show()
```




```
pip install mapclassify
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: mapclassify in /usr/local/lib/python3.10/dist-packages (2.5.0)
Requirement already satisfied: numpy>=1.3 in /usr/local/lib/python3.10/dist-packages (from mapclassify) (1.22.4)
Requirement already satisfied: pandas>=1.0 in /usr/local/lib/python3.10/dist-packages (from mapclassify) (1.5.3)
Requirement already satisfied: scipy>=1.0 in /usr/local/lib/python3.10/dist-packages (from mapclassify) (1.10.1)
Requirement already satisfied: scikit-learn in /usr/local/lib/python3.10/dist-packages (from mapclassify) (1.2.2)
Requirement already satisfied: networkx in /usr/local/lib/python3.10/dist-packages (from mapclassify) (3.1)
Requirement already satisfied: python-dateutil>=2.8.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.0->mapclassify) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=1.0->mapclassify) (2022.7.1)
Requirement already satisfied: joblib>=1.1.1 in /usr/local/lib/python3.10/dist-packages (from scikit-learn->mapclassify) (1.2.0)
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.10/dist-packages (from scikit-learn->mapclassify) (3.1.0)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.8.1->pandas>=1.0->mapclassi
```

```
murders = murder[murder['Sub_Group_Name']== '3. Total']   #we need only total number of victims per state
murders= murders.groupby(['Area_Name'])['Victims_Total'].sum().sort_values(ascending = False).reset_index()

murdersbad = murders.head(15) #top highest states
murdersgood = murders.tail(15) #top lowest states/ut

#sns.set_context("talk")
sns.set_style("darkgrid")
plt.style.use("fivethirtyeight")

f , axes = plt.subplots(2,1, figsize = (15,14))
ax = sns.barplot(x = 'Victims_Total' , y = 'Area_Name' , data = murdersbad, ax = axes[0],palette= 'bright') #barplot for highest numbers of v
axes[0].set_title("15 states  with Highest number of Victims", size = 20)
axes[0].set_ylabel('')
axes[0].set_xlabel('No. of Victims')
ax1 = sns.barplot(x = 'Victims_Total' , y = 'Area_Name' , data = murdersgood, ax = axes[1],palette= 'dark' )#barplot for lowest numbers of vi
axes[1].set_title("15 states and UT with lowest number of Victims", size = 20)
axes[1].set_ylabel('')
axes[1].set_xlabel('No. of Victims')
plt.tight_layout()  #tight layout so that subplots look fitted
plt.subplots_adjust(hspace= .3) #adjusting the space between the plots
#murders.to_csv('murder.csv',index=False)
```

```
for p in ax.patches:
        ax.annotate("%.f" % p.get_width(), xy=(p.get_width(), p.get_y()+p.get_height()/2),
            xytext=(5, 0), textcoords='offset points', ha="left", va="center")

for p in ax1.patches:
        ax1.annotate("%.f" % p.get_width(), xy=(p.get_width(), p.get_y()+p.get_height()/2),
            xytext=(5, 0), textcoords='offset points', ha="left", va="center")
```

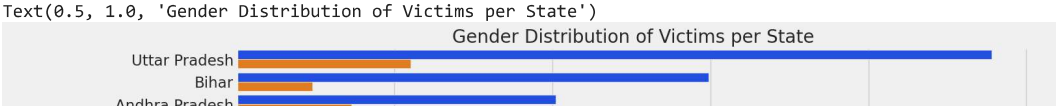
Inference: With almost 60000 murders Uttarpradesh has highest victims of murder. Bihar has second highest number of victims which has less than 25000 victims than Uttarpradesh. Interestingly Uttarpradesh has the highest population in the country. Bihar has less population than maharashtra still it has higher number of victims than Maharashtra.

Union Territory Lakshadweep has lowest number of Murder Victims. Factors like population of the state and **Population density** might be responsible for the number of murder victims in the state.

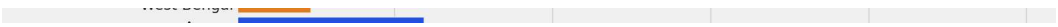
Gender Distribution of victims per state


```
murdergs = murder.groupby(['Area_Name' , 'Sub_Group_Name'])['Victims_Total'].sum().sort_values(ascending = False).reset_index() #groupby stat
murdergs = murdergs[murdergs['Sub_Group_Name']!= '3. Total'] #we dont need total category of gender
plt.figure(figsize = (14,15))
plt.style.use("fivethirtyeight")
sns.barplot( x = 'Victims_Total', y = 'Area_Name' , hue = 'Sub_Group_Name' , data = murdergs,palette= 'bright') #barplot
plt.title('Gender Distribution of Victims per State',size = 20)
```

```
Text(0.5, 1.0, 'Gender Distribution of Victims per State')
```



Inference : Similar to above results males are more likely to be get murdered as compared to females. Interesting thing to notice in this graph is Mahrashtra has second highest female victims.



Statewise Distribution of victims according to their age


```
murdernt = murder[murder['Sub_Group_Name']== '3. Total']
murdersa = murdernt.groupby(['Area_Name'])['Victims_Upto_10_15_Yrs','Victims_Above_50_Yrs',
                                           'Victims_Upto_10_Yrs', 'Victims_Upto_15_18_Yrs',
                                           'Victims_Upto_18_30_Yrs','Victims_Upto_30_50_Yrs',].sum().reset_index() #grouping with state and a
murdersa = murdersa.melt('Area_Name', var_name='AgeGroup',  value_name='vals') #melting the dataset

sns.set_style("darkgrid")
sns.set_context("talk")
plt.style.use("fivethirtyeight")


f, axes = plt.subplots(3,2, figsize = (30,30))
plt.figure(figsize = (14,15))
sns.barplot(x = 'vals', y = 'Area_Name', data = murdersa[murdersa['AgeGroup']== 'Victims_Upto_10_Yrs'].sort_values(by=['vals'],ascending = Fa
axes[0,0].set_title(' Age 0 - 10', size = 20)
axes[0,0].set_ylabel('')
axes[0,0].set_xlabel('No.of Victims')

sns.barplot(x = 'vals', y = 'Area_Name', data = murdersa[murdersa['AgeGroup']== 'Victims_Upto_10_15_Yrs'].sort_values(by=['vals'],ascending =
axes[0,1].set_title(' Age 10 - 15', size = 20)
axes[0,1].set_ylabel('')
axes[0,1].set_xlabel('No.of Victims')


sns.barplot(x = 'vals', y = 'Area_Name', data = murdersa[murdersa['AgeGroup']== 'Victims_Upto_15_18_Yrs'].sort_values(by=['vals'],ascending =
axes[1,0].set_title(' Age 15 - 18', size = 20)
axes[1,0].set_ylabel('')
axes[1,0].set_xlabel('No.of Victims')

sns.barplot(x = 'vals', y = 'Area_Name', data = murdersa[murdersa['AgeGroup']== 'Victims_Upto_18_30_Yrs'].sort_values(by=['vals'],ascending =
axes[1,1].set_title(' Age 18 - 30', size = 20)
axes[1,1].set_ylabel('')
axes[1,1].set_xlabel('No.of Victims')

sns.barplot(x = 'vals', y = 'Area_Name', data = murdersa[murdersa['AgeGroup']== 'Victims_Upto_30_50_Yrs'].sort_values(by=['vals'],ascending =
axes[2,0].set_title(' Age 30 - 50', size = 20)
axes[2,0].set_ylabel('')
axes[2,0].set_xlabel('No.of Victims')

sns.barplot(x = 'vals', y = 'Area_Name', data = murdersa[murdersa['AgeGroup']== 'Victims_Above_50_Yrs'].sort_values(by=['vals'],ascending = F
axes[2,1].set_title(' Age 50 +', size = 20)
axes[2,1].set_ylabel('')
axes[2,1].set_xlabel('No.of Victims')
plt.tight_layout()
#plt.subplots_adjust(hspace= .0001)
```