

```

import pandas as pd

# Load the dataset
df = pd.read_csv('/content/Crime Prediction in Chicago_Dataset.csv')

# Display the first 5 rows of the DataFrame
print("DataFrame Head:")
print(df.head())

# Print a concise summary of the DataFrame
print("\nDataFrame Info:")
df.info()

# Calculate and display the total number of missing values for each column
print("\nMissing Values per Column:")
print(df.isnull().sum())

```

DataFrame Head:

	Ward	Primary Type	Year	Latitude	Longitude
0	1	BATTERY	2022	22.339095	88.396919
1	1	MOTOR VEHICLE THEFT	2022	22.339108	88.380118
2	1	MOTOR VEHICLE THEFT	2022	22.339108	88.380118
3	1	ROBBERY	2022	22.339108	88.380118
4	1	THEFT	2022	22.339112	88.392130

DataFrame Info:

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 234889 entries, 0 to 234888
Data columns (total 5 columns):
 #   Column      Non-Null Count  Dtype  
--- 
 0   Ward         234889 non-null   int64  
 1   Primary Type 234889 non-null   object  
 2   Year          234889 non-null   int64  
 3   Latitude      234889 non-null   float64 
 4   Longitude     234889 non-null   float64  
dtypes: float64(2), int64(2), object(1)
memory usage: 9.0+ MB

```

Missing Values per Column:

Column	Missing Value Count
Ward	0
Primary Type	0
Year	0
Latitude	0
Longitude	0
dtype: int64	

```

print("Unique values in 'Primary Type' column:")
print(df['Primary Type'].unique())

```

```

print("\nData type of 'Ward' column:")
print(df['Ward'].dtype)

```

Unique values in 'Primary Type' column:

```

['BATTERY', 'MOTOR VEHICLE THEFT', 'ROBBERY', 'THEFT', 'OTHER OFFENSE',
 'ASSAULT', 'PUBLIC PEACE VIOLATION', 'ARSON', 'CRIMINAL DAMAGE', 'BURGLARY',
 'NARCOTICS', 'DECEPTIVE PRACTICE', 'INTIMIDATION', 'WEAPONS VIOLATION',
 'CRIMINAL TRESPASS', 'OFFENSE INVOLVING CHILDREN',
 'CRIMINAL SEXUAL ASSAULT', 'KIDNAPPING', 'OBSCENITY', 'LIQUOR LAW VIOLATION',
 'HOMICIDE', 'SEX OFFENSE', 'STALKING', 'INTERFERENCE WITH PUBLIC OFFICER',
 'CONCEALED CARRY LICENSE VIOLATION', 'PROSTITUTION', 'PUBLIC INDECENCY',
 'NON-CRIMINAL', 'HUMAN TRAFFICKING', 'GAMBLING', 'OTHER NARCOTIC VIOLATION']

```

Data type of 'Ward' column:
int64

```

unique_wards = df['Ward'].unique()
valid_ward_entered = False

while not valid_ward_entered:
    try:
        ward_number = int(input("Please enter a ward number for analysis: "))
        if ward_number in unique_wards:
            valid_ward_entered = True
            print(f"Ward number {ward_number} selected for analysis.")
        else:

```



```
print("Invalid ward number. Please enter a ward number that exists in the dataset.")
print(f"Available wards are: {sorted(unique_wards)}")
except ValueError:
    print("Invalid input. Please enter an integer for the ward number.")
```

```
Please enter a ward number for analysis: 18
Ward number 18 selected for analysis.
```

```
ward_df = df[df['Ward'] == ward_number]

crime_type_counts = ward_df['Primary Type'].value_counts()

print(f"\nCrime Type Frequencies for Ward {ward_number}:")
print(crime_type_counts)
```

```
Crime Type Frequencies for Ward 18:
```

```
Primary Type
BATTERY           128
THEFT             107
ASSAULT            75
CRIMINAL DAMAGE   70
MOTOR VEHICLE THEFT 62
WEAPONS VIOLATION 49
OTHER OFFENSE      43
ROBBERY            38
BURGLARY           29
DECEPTIVE PRACTICE 23
NARCOTICS          20
CRIMINAL TRESPASS   9
SEX OFFENSE         4
ARSON              3
OFFENSE INVOLVING CHILDREN 3
PUBLIC PEACE VIOLATION 1
INTIMIDATION        1
STALKING            1
CRIMINAL SEXUAL ASSAULT 1
```

```
Name: count, dtype: int64
```

```
total_crimes_ward = crime_type_counts.sum()
crime_type_percentages = (crime_type_counts / total_crimes_ward) * 100

print(f"\nPercentage Distribution of Crime Types for Ward {ward_number}:")
print(crime_type_percentages)
```

```
Percentage Distribution of Crime Types for Ward 18:
```

```
Primary Type
BATTERY           19.190405
THEFT             16.041979
ASSAULT            11.244378
CRIMINAL DAMAGE   10.494753
MOTOR VEHICLE THEFT 9.295352
WEAPONS VIOLATION 7.346327
OTHER OFFENSE      6.446777
ROBBERY            5.697151
BURGLARY           4.347826
DECEPTIVE PRACTICE 3.448276
NARCOTICS          2.998501
CRIMINAL TRESPASS   1.349325
SEX OFFENSE         0.599700
ARSON              0.449775
OFFENSE INVOLVING CHILDREN 0.449775
PUBLIC PEACE VIOLATION 0.149925
INTIMIDATION        0.149925
STALKING            0.149925
CRIMINAL SEXUAL ASSAULT 0.149925
```

```
Name: count, dtype: float64
```

```
crime_distribution_df = pd.DataFrame({
    'Frequency': crime_type_counts,
    'Percentage': crime_type_percentages
})

print(f"\nCrime Type Frequencies and Percentages for Ward {ward_number}:")
print(crime_distribution_df)
```



Crime Type Frequencies and Percentages for Ward 18:

Primary Type	Frequency	Percentage
BATTERY	128	19.190405
THEFT	107	16.041979
ASSAULT	75	11.244378
CRIMINAL DAMAGE	70	10.494753
MOTOR VEHICLE THEFT	62	9.295352
WEAPONS VIOLATION	49	7.346327
OTHER OFFENSE	43	6.446777
ROBBERY	38	5.697151
BURGLARY	29	4.347826
DECEPTIVE PRACTICE	23	3.448276
NARCOTICS	20	2.998501
CRIMINAL TRESPASS	9	1.349325
SEX OFFENSE	4	0.599700
ARSON	3	0.449775
OFFENSE INVOLVING CHILDREN	3	0.449775
PUBLIC PEACE VIOLATION	1	0.149925
INTIMIDATION	1	0.149925
STALKING	1	0.149925
CRIMINAL SEXUAL ASSAULT	1	0.149925

```

import matplotlib.pyplot as plt

# Create the bar chart
plt.figure(figsize=(12, 7))
plt.bar(crime_distribution_df.index, crime_distribution_df['Percentage'], color='skyblue')

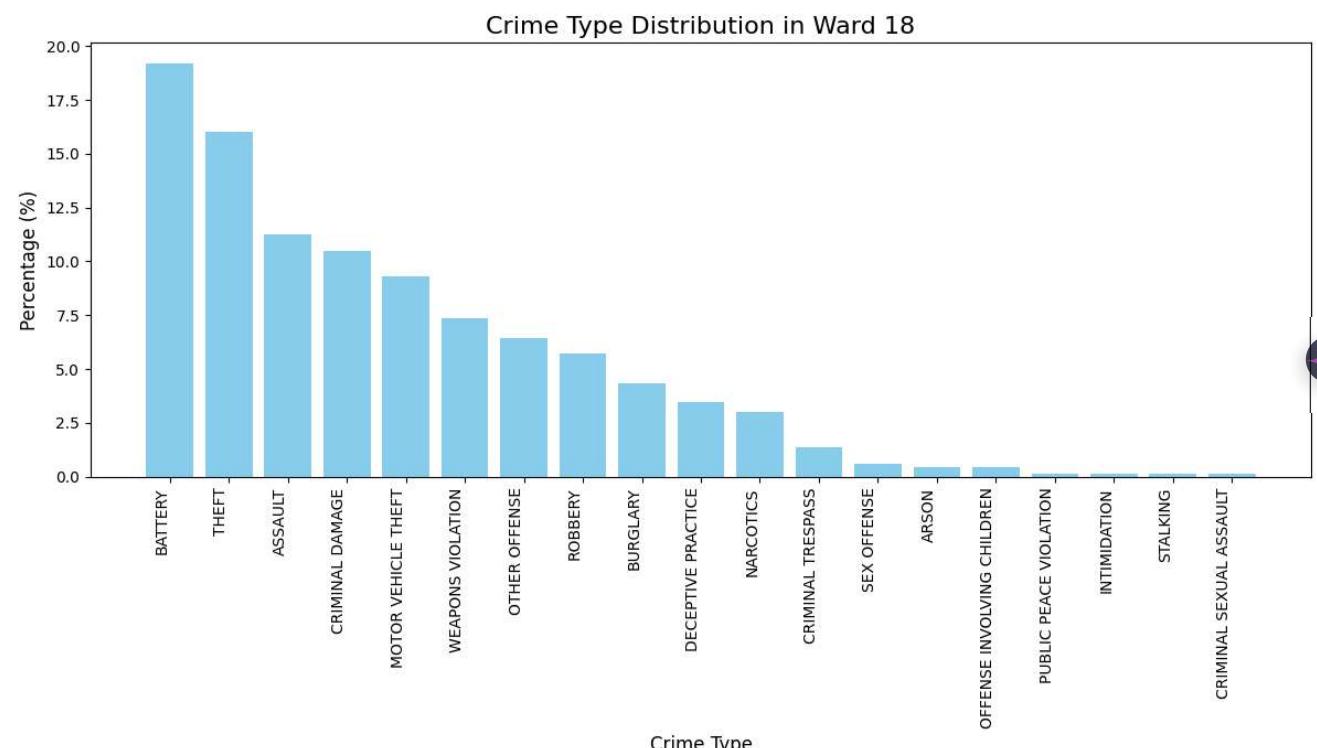
# Set title and labels
plt.title(f'Crime Type Distribution in Ward {ward_number}', fontsize=16)
plt.xlabel('Crime Type', fontsize=12)
plt.ylabel('Percentage (%)', fontsize=12)

# Rotate x-axis labels for better readability
plt.xticks(rotation=90, ha='right', fontsize=10)

# Add a legend (though not strictly necessary for a single bar series, it's good practice)
# plt.legend(['Percentage'])

plt.tight_layout() # Adjust layout to prevent labels from overlapping
plt.show()

```



```

top_3_crimes = crime_distribution_df.sort_values(by='Frequency', ascending=False).head(3)

print("\nTop 3 Crime Types, Frequencies, and Percentages for the selected ward:")
print(top_3_crimes)

```

```

Top 3 Crime Types, Frequencies, and Percentages for the selected ward:
   Primary Type      Frequency      Percentage
BATTERY             128     19.190405
THEFT               107     16.041979
ASSAULT              75     11.244378

```

```

center_latitude = ward_df['Latitude'].mean()
center_longitude = ward_df['Longitude'].mean()

print(f"Central Latitude for Ward {ward_number}: {center_latitude}")
print(f"Central Longitude for Ward {ward_number}: {center_longitude}")

```

```

Central Latitude for Ward 18: 22.45482353509745
Central Longitude for Ward 18: 88.3712941489655

```

```

min_lat = ward_df['Latitude'].min()
max_lat = ward_df['Latitude'].max()
min_lon = ward_df['Longitude'].min()
max_lon = ward_df['Longitude'].max()

# Prepare polygon coordinates (a rectangle for simplicity based on min/max lat/lon)
polygon_coords = [
    [min_lat, min_lon],
    [max_lat, min_lon],
    [max_lat, max_lon],
    [min_lat, max_lon],
    [min_lat, min_lon] # Close the polygon
]

print(f"Minimum Latitude for Ward {ward_number}: {min_lat}")
print(f"Maximum Latitude for Ward {ward_number}: {max_lat}")
print(f"Minimum Longitude for Ward {ward_number}: {min_lon}")
print(f"Maximum Longitude for Ward {ward_number}: {max_lon}")
print("\nPolygon Coordinates:")
print(polygon_coords)

```

```

Minimum Latitude for Ward 18: 22.45453355000004
Maximum Latitude for Ward 18: 22.45512513000003
Minimum Longitude for Ward 18: 88.25193096999999
Maximum Longitude for Ward 18: 88.43703398999999

```

```

Polygon Coordinates:
[[22.45453355000004, 88.25193096999999], [22.45512513000003, 88.25193096999999], [22.45512513000003, 88.43703398999999], [22.45453355000004, 88.43703398999999], [22.45453355000004, 88.25193096999999]]

```

```

styled_html = f"""


Ward:</span> {ward_number}</p>


Total Crimes:</span> {total_crimes_ward}</p>


Top 3 Crime Types:</span></p>



"""

for crime_type, row in top_3_crimes.iterrows():
    styled_html += f'        <li><span style="color: #e91e63; font-size: 13px;">{crime_type}</span> {row["Frequency"]}</li>
    styled_html += """
</ul>
</div>"""


```

```

import folium

m = folium.Map(location=[center_latitude, center_longitude], zoom_start=12)

folium.Marker(
    location=[center_latitude, center_longitude],
    popup=folium.Popup(styled_html, max_width=300)
).add_to(m)

folium.Polygon(
    locations=polygon_coords,

```



```

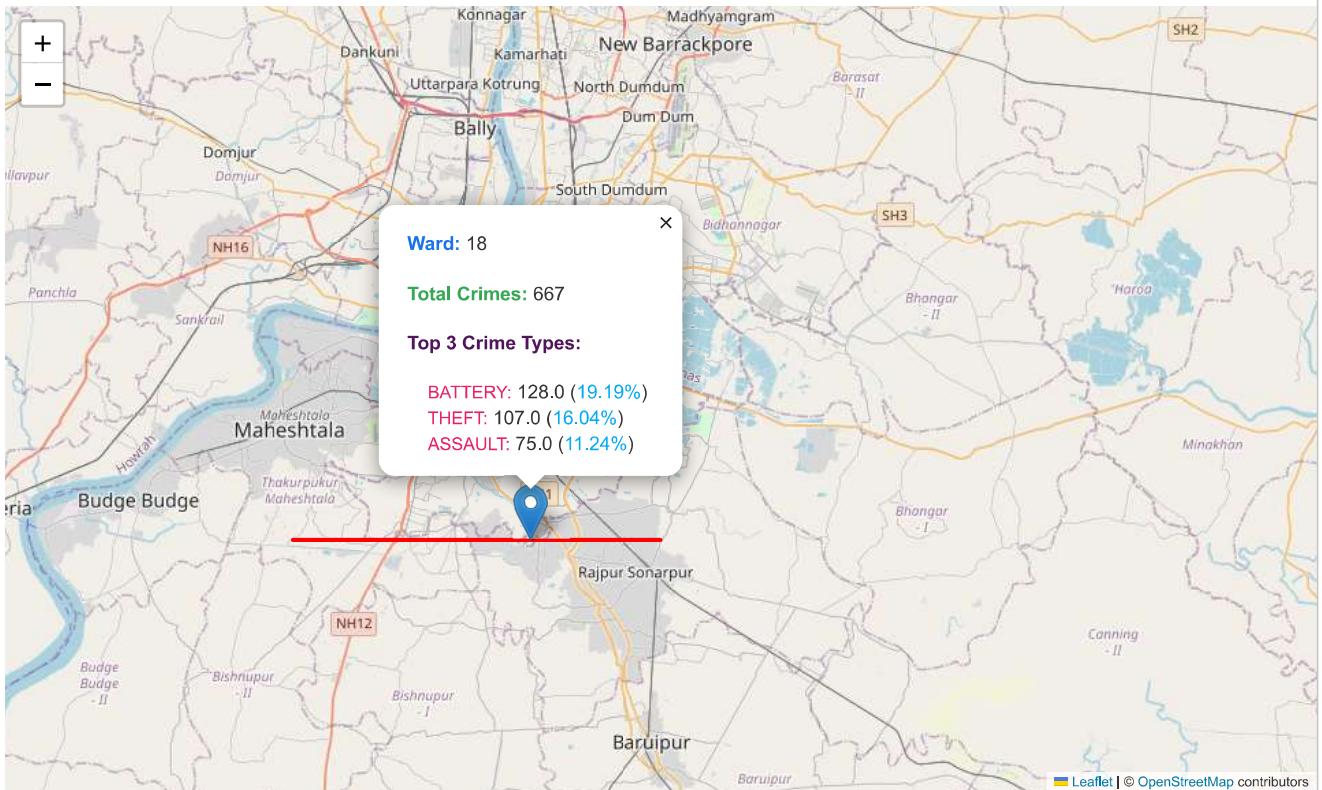
        color='red',
        fill=True,
        fill_color='red',
        fill_opacity=0.2,
        tooltip=f"Crime Zone for Ward {ward_number}"
).add_to(m)

```

```

# Display the map
m

```



```

top_3_crime_names = top_3_crimes.index.tolist()

top_crimes_df = ward_df[ward_df['Primary Type'].isin(top_3_crime_names)]

print(f"DataFrame Head for Top 3 Crimes in Ward {ward_number}:")
print(top_crimes_df.head())

print(f"\nShape of the filtered DataFrame (top_crimes_df): {top_crimes_df.shape}")
print(f"Unique crime types in top_crimes_df: {top_crimes_df['Primary Type'].unique()}")

```

```

DataFrame Head for Top 3 Crimes in Ward 18:
   Ward Primary Type Year  Latitude  Longitude
49052    18      THEFT 2022  22.454534  88.304466
49058    18      BATTERY 2022  22.454541  88.418734
49061    18      BATTERY 2022  22.454547  88.405300
49062    18      THEFT 2022  22.454547  88.405300
49070    18      THEFT 2022  22.454566  88.330038

```

```

Shape of the filtered DataFrame (top_crimes_df): (310, 5)
Unique crime types in top_crimes_df: ['THEFT' 'BATTERY' 'ASSAULT']

```

```

from folium.plugins import HeatMap

# Prepare data for heatmap: list of [latitude, longitude]
heatmap_data = top_crimes_df[['Latitude', 'Longitude']].values.tolist()

print(f"First 5 entries of heatmap data for Ward {ward_number}:")
print(heatmap_data[:5])
print(f"\nTotal number of points for heatmap: {len(heatmap_data)}")

```

```

First 5 entries of heatmap data for Ward 18:
[[22.45453358, 88.30446579], [22.45454117, 88.41877351], [22.45454699, 88.40530018999999], [22.45454699, 88.40530018999999], [22.45454699, 88.40530018999999],

```

Total number of points for heatmap: 310

```
import folium
from folium.plugins import HeatMap
m = folium.Map(location=[center_latitude, center_longitude], zoom_start=12)

folium.Marker(
    location=[center_latitude, center_longitude],
    popup=folium.Popup(styled_html, max_width=300)
).add_to(m)

folium.Polygon(
    locations=polygon_coords,
    color='red',
    fill=True,
    fill_color='red',
    fill_opacity=0.2,
    tooltip=f"Crime Zone for Ward {ward_number}"
).add_to(m)

HeatMap(heatmap_data).add_to(m)
```

```
# Display the updated map
m
```

