```
from google.colab import files

# This will open a file explorer window for you to select files from your local machine.
uploaded = files.upload()
```

Choose Files crime_kolkata.csv

crime_kolkata.csv(text/csv) - 764624 bytes, last modified: 12/16/2025 - 100% done

```
Saving crime_kolkata.csv to crime_kolkata.csv
```

```
import pandas as pd

df = pd.read_csv('crime_kolkata.csv')
df.head()
```

	Ward	Year	TimeSlot	Month	Crime_Count	Latitude	Longitude
0	54	2008	Afternoon	4	1	22.339107	88.379913
1	54	2021	Evening	9	1	22.339318	88.379008
2	54	2005	Afternoon	3	1	22.340336	88.379100
3	54	2022	Evening	5	1	22.340359	88.377622
4	54	2003	Evening	3	1	22.341539	88.379395

Next steps: Generate code with df New interactive sheet

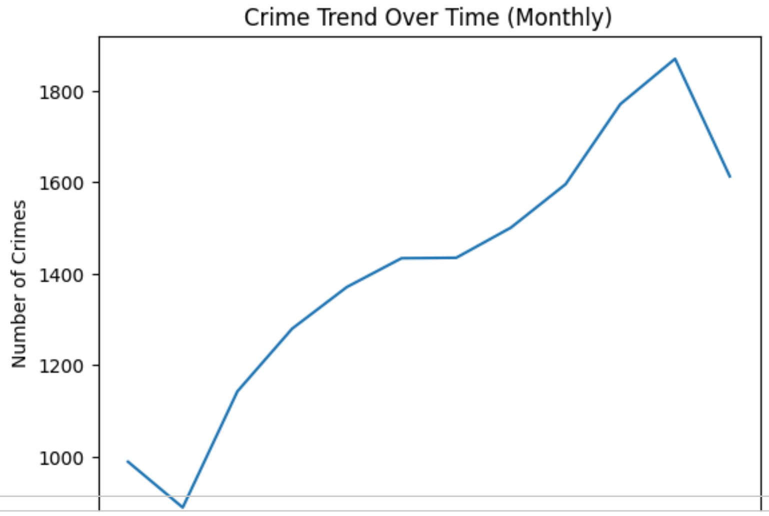
```
df.shape
df.columns
```

```
Index(['Ward', 'Year', 'TimeSlot', 'Month', 'Crime_Count', 'Latitude',
       'Longitude'],
      dtype='object')
```

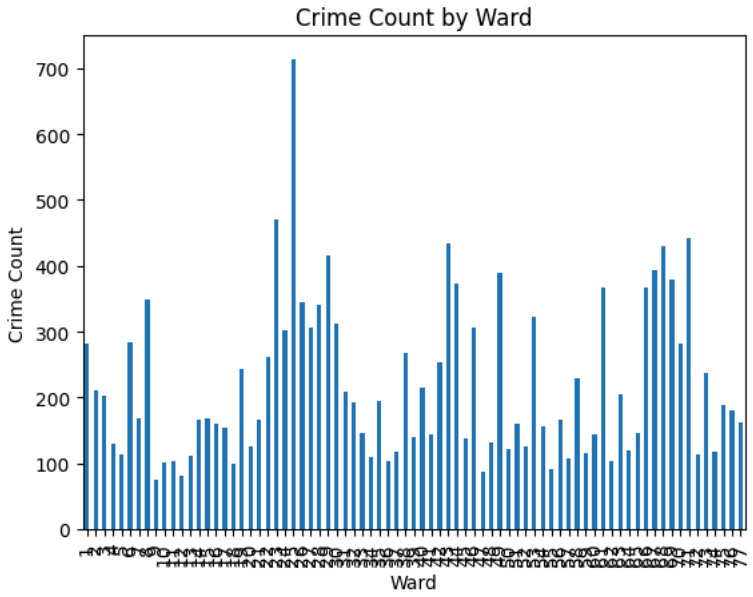
```
df.describe()
```

	Ward	Year	Month	Crime_Count	Latitude	Longitude
count	16892.000000	16892.000000	16892.000000	16892.000000	16892.000000	16892.000000
mean	39.872958	2012.718387	7.152972	15.641073	22.528251	88.321068
std	21.783499	8.837046	3.338222	38.239486	0.091208	0.063217
min	1.000000	2001.000000	1.000000	1.000000	22.339107	88.070735
25%	23.000000	2002.000000	4.000000	1.000000	22.456156	88.277657
50%	40.000000	2013.000000	7.000000	1.000000	22.519638	88.327419
75%	61.000000	2022.000000	10.000000	7.000000	22.596677	88.367307
max	77.000000	2025.000000	12.000000	565.000000	22.717048	88.469171

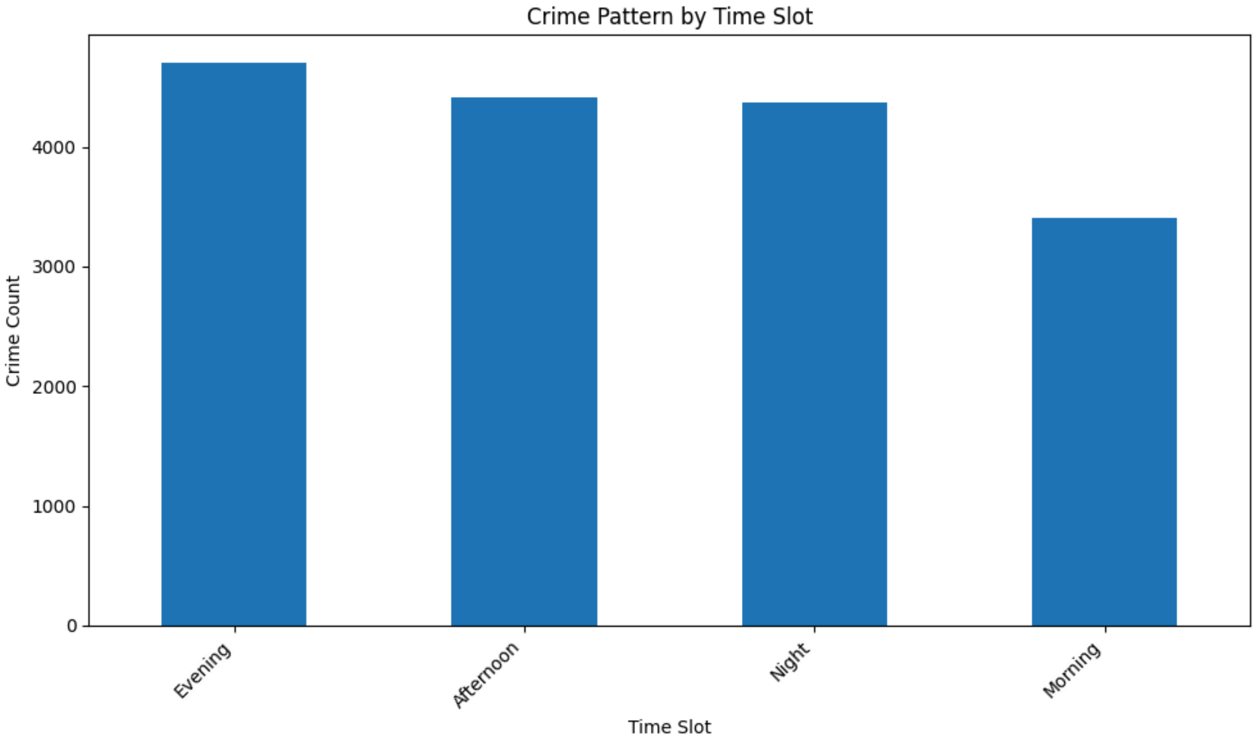
```
import matplotlib.pyplot as plt

# The DataFrame 'df' already contains a 'Month' column (as seen from df.columns),
# so there's no need to create a 'Date' column or extract the month again.
# The original error 'KeyError: 'Date'' occurred because 'df' did not have a 'Date' column.

# Count crimes per month using the existing 'Month' column
monthly_crime = df.groupby('Month').size()

# plot
plt.figure()
monthly_crime.plot()
plt.xlabel('Month')
plt.ylabel('Number of Crimes')
plt.title('Crime Trend Over Time (Monthly)')
plt.show()
```



```
area_crime = df['Ward'].value_counts().sort_index()

plt.figure()
area_crime.plot(kind='bar')
plt.xlabel('Ward')
plt.ylabel('Crime Count')
plt.title('Crime Count by Ward')
plt.show()
```



```
# The original error 'KeyError: 'Date'' occurred because the DataFrame 'df' does not have a 'Date' column.
# Instead of a specific 'Hour' column, we can analyze crime patterns using the 'TimeSlot' column.
# The 'TimeSlot' column contains categories like 'Afternoon', 'Night', 'Evening', which represent time periods.

timeslot_crime = df.groupby('TimeSlot').size().sort_values(ascending=False)

plt.figure(figsize=(10, 6)) # Make the plot larger for better readability
timeslot_crime.plot(kind='bar')
plt.xlabel('Time Slot')
plt.ylabel('Crime Count')
plt.title('Crime Pattern by Time Slot')
plt.xticks(rotation=45, ha='right') # Rotate x-axis labels for better readability
plt.tight_layout() # Adjust layout to prevent labels from overlapping
plt.show()
```

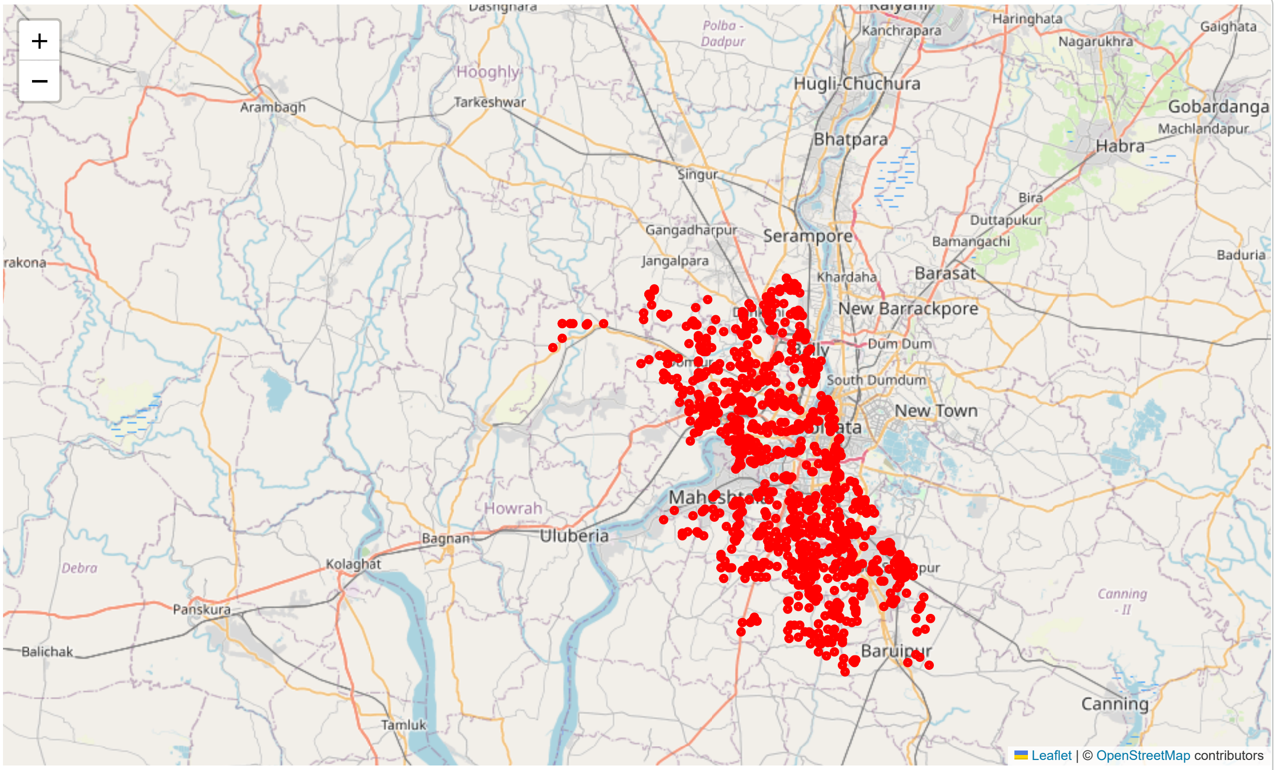


```
!pip install folium
```

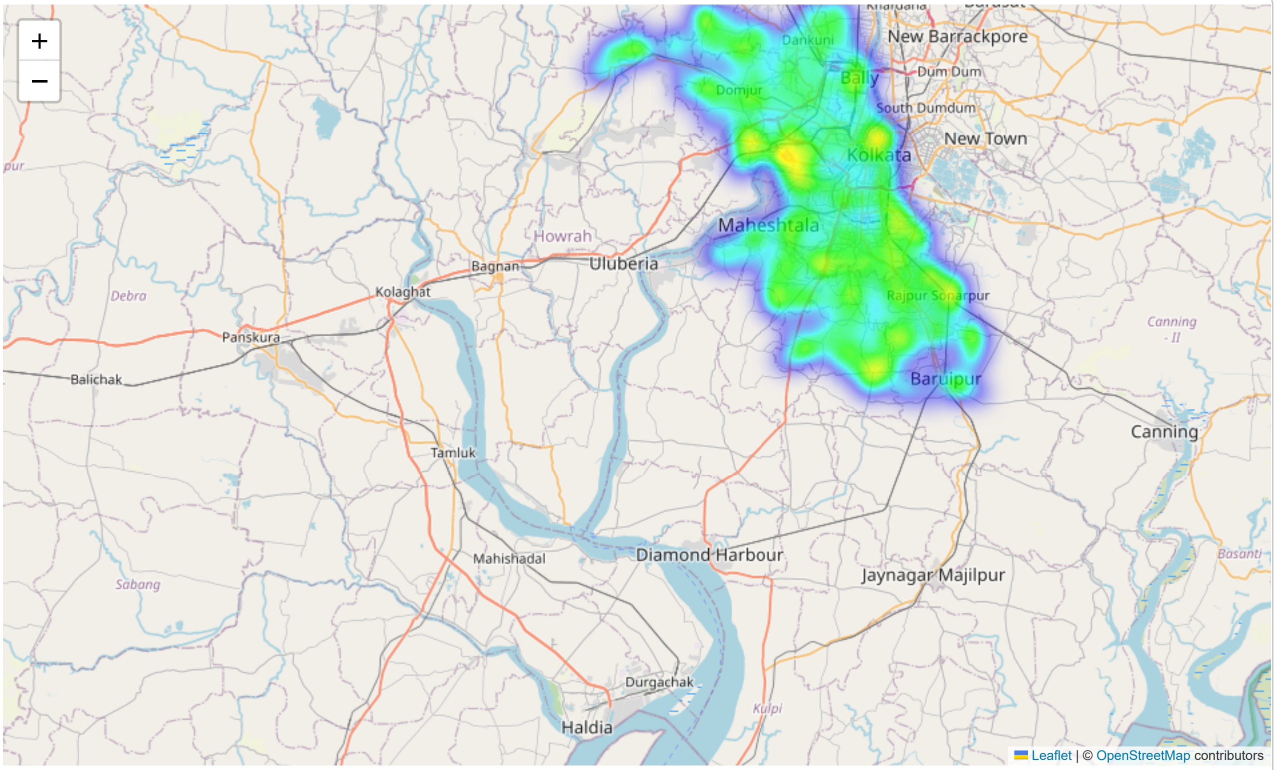
```
Requirement already satisfied: folium in /usr/local/lib/python3.12/dist-packages (0.20.0)
Requirement already satisfied: branca>=0.6.0 in /usr/local/lib/python3.12/dist-packages (from folium) (0.8.2)
Requirement already satisfied: jinja2>=2.9 in /usr/local/lib/python3.12/dist-packages (from folium) (3.1.6)
Requirement already satisfied: numpy in /usr/local/lib/python3.12/dist-packages (from folium) (2.0.2)
Requirement already satisfied: requests in /usr/local/lib/python3.12/dist-packages (from folium) (2.32.4)
Requirement already satisfied: xyzservices in /usr/local/lib/python3.12/dist-packages (from folium) (2025.11.0)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.12/dist-packages (from jinja2>=2.9->folium) (3.0.3)
Requirement already satisfied: charset_normalizer<4,>=2 in /usr/local/lib/python3.12/dist-packages (from requests->folium) (
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.12/dist-packages (from requests->folium) (3.11)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.12/dist-packages (from requests->folium) (2.5.0)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.12/dist-packages (from requests->folium) (2025.1
```

```
import folium
from folium.plugins import HeatMap
```

```
import folium

# Define a center for kolkata, as 'kolkata_center' is not defined in this cell.
# This assumes kolkata's approximate center.
Kolkata_center = [22.527634, 88.320593]

# Initialize the map object 'm' before using it
m = folium.Map(location=Kolkata_center, zoom_start=11)

for _, row in df.sample(1000).iterrows():   # limit points for speed
    folium.CircleMarker(
        location=[row['Latitude'], row['Longitude']],
        radius=2,
        color='red',
        fill=True,
        fill_opacity=0.6
    ).add_to(m)

m
```



```
heat_data = df[['Latitude', 'Longitude']].values.tolist()

heat_map = folium.Map(location=Kolkata_center, zoom_start=11)

HeatMap(
    heat_data,
    radius=10,
    blur=15,
    max_zoom=13
).add_to(heat_map)

heat_map
```



```
crime_grouped = (
    df.groupby(['Ward', 'Year', 'Month'])
      .size()
      .reset_index(name='Crime_Count')
)

crime_grouped.head()
```

	Ward	Year	Month	Crime_Count
0	1	2001	3	2
1	1	2001	4	1
2	1	2001	5	1
3	1	2001	6	1
4	1	2001	7	1

Next steps: Generate code with `crime_grouped` New interactive sheet

```
X = crime_grouped[['Ward', 'Year', 'Month']]
y = crime_grouped['Crime_Count']
```

```
from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split( X, y, test_size=0.2)
```

```
X_train.shape, X_test.shape
```

```
((7308, 3), (1827, 3))
```

```
from sklearn.ensemble import RandomForestRegressor
import pandas as pd

model = RandomForestRegressor(
    n_estimators=100)

model.fit(X_train, y_train)
```

```
▾ RandomForestRegressor  i ?

RandomForestRegressor()
```

```
ypred = model.predict(X_test)
#in array show the round rasult
ypred.round()
```

```
array([1., 1., 1., ..., 4., 2., 1.])
```

```
import numpy as np

from sklearn.metrics import mean_absolute_error,mean_squared_error
mae=mean_absolute_error(y_test,ypred)
mse=mean_squared_error(y_test,ypred)
rmse=np.sqrt(mse)
```

```
mae,mse,rmse
```

```
(0.45286261631089225, 0.428023973727422, np.float64(0.6542354115510884))
```

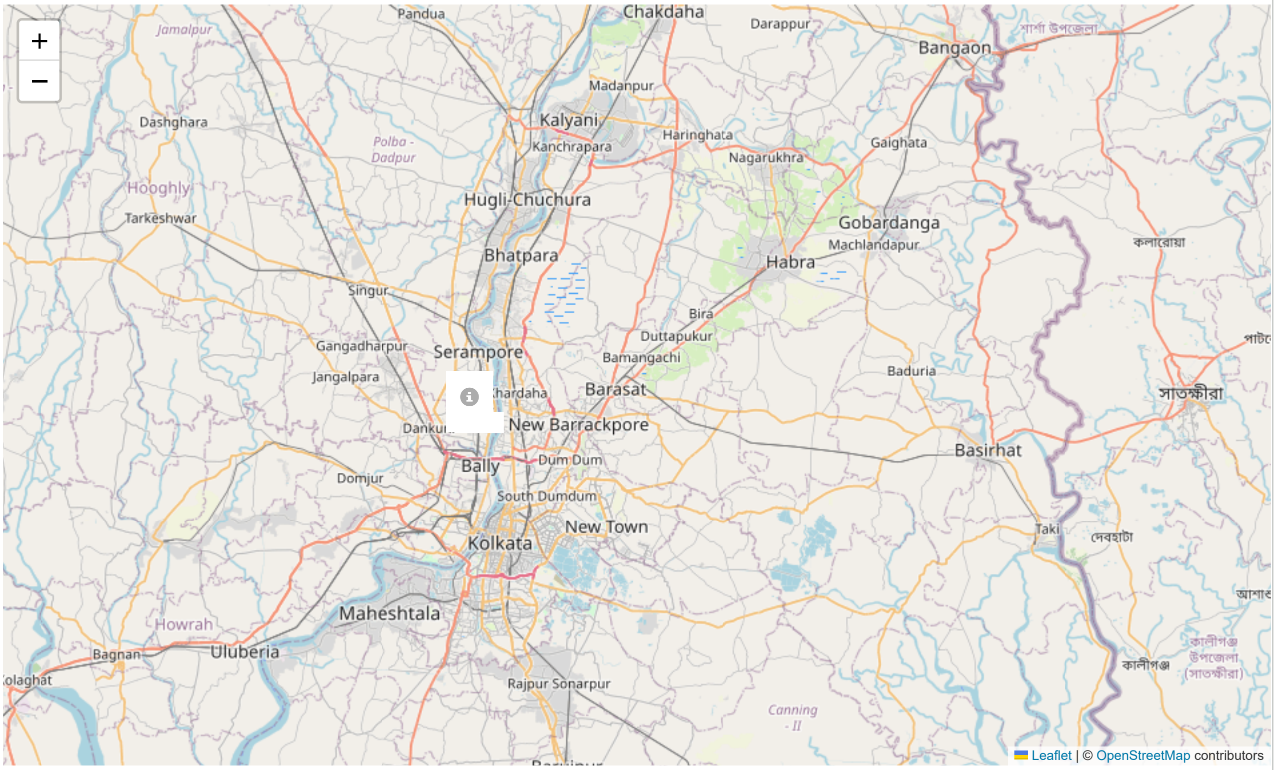
```
from sklearn.metrics import r2_score

y_pred = model.predict(X_test)

r2 = r2_score(y_test, y_pred)
print("R² Score:", r2)
```

```
R² Score: 0.6682223243118471
```

```
print("Crime Prediction System")
print("-----------------------")

def predict_crime(area, year, month):

    # Create a DataFrame for the new input with correct column names matching X_train
    input_data = pd.DataFrame([[area, year, month]],
                              columns=['Ward', 'Year', 'Month'])

    # Make prediction directly using input_data
    prediction = model.predict(input_data)

    # Return the predicted crime count (round to nearest integer as crime counts are discrete)
    return round(prediction[0])

area = int(input("enter ward no (1–77): "))
year = int(input("Enter Year (e.g., 2026): "))
month = int(input("Enter Month (1–12): "))


prediction = predict_crime(area, year, month)

print("\n Prediction Result")
print("-------------------")
print(f"Expected number of crimes: {prediction}")
```

```
Crime Prediction System
-----------------------
enter ward no (1–77): 77
Enter Year (e.g., 2026): 2026
Enter Month (1–12): 12

 Prediction Result
-------------------
Expected number of crimes: 4
```

```
import folium

# Get latitude and longitude for the entered community area
community_data = df[df['Ward'] == area]
if not community_data.empty:
    lat = community_data['Latitude'].mean()
    lon = community_data['Longitude'].mean()
else:
    # Fallback to Kolkata center if the community area is not found or has no coordinates
    lat, lon = Kolkata_center

# Use the prediction from the previous cell
predicted_crimes = prediction

# Define risk level and color based on predicted crimes
if predicted_crimes <= 1:
    risk = "Low"
    color = "green"
elif predicted_crimes <= 2:
    risk = "Medium"
    color = "orange"
else:
    risk = "High"
    color = "red"

m = folium.Map(location=[lat, lon], zoom_start=13)

folium.Marker(
    location=[lat, lon],
    popup=f"""
    <b>Community Area:</b> {area}<br>
    <b>Date:</b> {month}/{year} <br>
    <b>Predicted Crimes:</b> {predicted_crimes}<br>
    <b>Risk Level:</b> {risk}
    """,
    icon=folium.Icon(color=color)
).add_to(m)

m
```



```
import matplotlib.pyplot as plt

plt.figure(figsize=(7,5))

# Predicted values (blue)
```

```
plt.scatter(y_test, y_pred, color='blue', alpha=0.6, label='Predicted')

# Ideal line (perfect prediction)
plt.plot(
    [y_test.min(), y_test.max()],
    [y_test.min(), y_test.max()],
    color='red',
    linewidth=2,
    label='Ideal (y = x)'
)

plt.xlabel("Actual Crime Count")
plt.ylabel("Predicted Crime Count")
plt.title("Actual vs Predicted Crime Count")
plt.legend()
plt.grid(True)

plt.show()
```