In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```
idata = pd.read_csv(r"C:\Users\ASUS\Downloads\Predictive Crime Analytics-20240318T141844Z-001\Predictive Crime A
```

```
C:\Users\ASUS\AppData\Local\Temp\ipykernel_9744\1486523831.py:1: DtypeWarning: Columns (19,20) have mixed types.
Specify dtype option on import or set low_memory=False.
  idata = pd.read_csv(r"C:\Users\ASUS\Downloads\Predictive Crime Analytics-20240318T141844Z-001\Predictive Crime
Analytics\FIR_Details_Data.csv")
```

In [3]:
```
idata.shape
```

Out[3]: (1694191, 41)

In [4]:
```
idata.head()
```

Out[4]:

	District_Name	UnitName	FIRNo	RI	Year	Month	Offence_From_Date	Offence_To_Date	FIR_Reg_DateTime	FIR_Date	...
0	Bagalkot	Amengad PS	0001/2016	1	2016	1	2015-12-27 12:00:00.000	2015-12-27 12:05:00.000	2016-01-05 11:00:00.000	05/01/2016	...
1	Bagalkot	Amengad PS	0002/2016	1	2016	1	2016-01-12 17:30:00.000	2016-01-12 17:35:00.000	2016-01-12 19:00:00.000	12/01/2016	...
2	Bagalkot	Amengad PS	0003/2016	1	2016	1	2016-01-12 17:45:00.000	2016-01-12 17:50:00.000	2016-01-12 19:30:00.000	12/01/2016	...
3	Bagalkot	Amengad PS	0004/2016	1	2016	1	2016-01-14 21:30:00.000	2016-01-14 21:35:00.000	2016-01-15 14:00:00.000	15/01/2016	...
4	Bagalkot	Amengad PS	0005/2016	1	2016	1	2016-01-18 15:00:00.000	2016-01-18 15:05:00.000	2016-01-18 19:30:00.000	18/01/2016	...

5 rows × 41 columns

In [5]:
```
idata.tail()
```

Out[5]:

	District_Name	UnitName	FIRNo	RI	Year	Month	Offence_From_Date	Offence_To_Date	FIR_Reg_DateTime	FIR_Da
1694186	Yadgir	Yadgiri Women PS	0002/2024	1	2024	1	2024-01-10 05:30:00.000	2024-01-10 21:30:00.000	2024-01-11 21:30:00.000	11/01/20
1694187	Yadgir	Yadgiri Women PS	0003/2024	1	2024	1	2024-01-19 22:30:00.000	2024-01-19 22:35:00.000	2024-01-29 19:30:00.000	29/01/20
1694188	Yadgir	Yadgiri Women PS	0004/2024	1	2024	2	2024-02-06 15:42:00.000	2024-02-06 15:45:00.000	2024-02-07 17:45:00.000	07/02/20
1694189	Yadgir	Yadgiri Women PS	0005/2024	1	2024	2	2024-02-19 12:10:00.000	2024-02-19 12:15:00.000	2024-02-24 17:00:00.000	24/02/20
1694190	Yadgir	Yadgiri Women PS	0006/2024	1	2024	2	2024-02-26 22:30:00.000	2024-02-26 22:45:00.000	2024-02-28 18:30:00.000	28/02/20

5 rows × 41 columns

In [5]:
```
idata.isnull().sum()
```

Out[5]:
```
District_Name                      0
UnitName                           0
FIRNo                              0
RI                                 0
Year                               0
Month                              0
Offence_From_Date                  0
Offence_To_Date                    1
FIR_Reg_DateTime                   0
FIR_Date                           0
FIR Type                           2
FIR_Stage                          0
Complaint_Mode                 18430
CrimeGroup_Name                    0
CrimeHead_Name                     0
Latitude                           5
Longitude                          5
ActSection                        42
IOName                           150
KGID                             150
IOAssigned_Date                1694182
Internal_IO                        0
Place of Offence                   0
Distance from PS                 567
Beat_Name                        197
Village_Area_Name                138
Male                               0
Female                             0
Boy                                0
Girl                               0
Age 0                              0
VICTIM COUNT                       0
Accused Count                      0
Arrested Male                      0
Arrested Female                    0
Arrested Count\tNo.                0
Accused_ChargeSheeted Count        0
Conviction Count                   0
FIR_ID                             0
Unit_ID                            0
Crime_No                           0
dtype: int64
```

In [6]:
```
idata.sample(10)
```

Out[6]:

	District_Name	UnitName	FIRNo	RI	Year	Month	Offence_From_Date	Offence_To_Date	FIR_Reg_DateTime
873271	Davanagere	Nyamathi PS	0039/2020	1	2020	3	2020-03-27 10:30:00.000	2020-03-27 10:35:00.000	2020-03-27 11:00:00.000
1313772	Mysuru Dist	K.R. Nagar PS	0303/2016	1	2016	7	2016-07-14 13:00:00.000	2016-07-14 13:01:00.000	2016-07-14 14:30:00.000
1437205	Shivamogga	Holehonnur PS	0084/2019	1	2019	3	2019-03-08 18:30:00.000	2019-03-08 18:31:00.000	2019-03-09 10:10:00.000
484793	Bengaluru City	Soladevanahalli PS	0274/2018	1	2018	9	2018-09-05 20:00:00.000	2018-09-05 20:05:00.000	2018-09-06 10:30:00.000
676188	Chamarajanagar	Chamarajanagar East PS	0059/2022	1	2022	5	2022-05-20 13:30:00.000	2022-05-20 14:00:00.000	2022-05-20 18:30:00.000
534256	Bengaluru City	Vyalikaval PS	0033/2019	1	2019	4	2019-04-02 22:00:00.000	2019-04-02 23:00:00.000	2019-04-03 11:00:00.000
82019	Belagavi Dist	Athani PS	0162/2017	1	2017	5	2017-05-03 18:00:00.000	2017-05-03 18:01:00.000	2017-05-04 10:00:00.000
1269596	Mysuru City	Laxmipuram PS	0076/2016	1	2016	9	2016-09-06 00:30:00.000	2016-09-06 01:00:00.000	2016-09-07 18:30:00.000
930912	Hassan	Channarayapatna Town PS	0123/2023	1	2023	6	2023-02-01 10:00:00.000	2023-02-01 10:30:00.000	2023-06-06 10:30:00.000
939377	Hassan	Hallymysore PS	0111/2019	1	2019	10	2019-10-03 08:00:00.000	2019-10-03 08:10:00.000	2019-10-03 17:00:00.000

10 rows × 41 columns

In [7]:
```
idata.iloc[0:3,0:10]
```

Out[7]:

	District_Name	UnitName	FIRNo	RI	Year	Month	Offence_From_Date	Offence_To_Date	FIR_Reg_DateTime	FIR_Date
0	Bagalkot	Amengad PS	0001/2016	1	2016	1	2015-12-27 12:00:00.000	2015-12-27 12:05:00.000	2016-01-05 11:00:00.000	05/01/2016
1	Bagalkot	Amengad PS	0002/2016	1	2016	1	2016-01-12 17:30:00.000	2016-01-12 17:35:00.000	2016-01-12 19:00:00.000	12/01/2016
2	Bagalkot	Amengad PS	0003/2016	1	2016	1	2016-01-12 17:45:00.000	2016-01-12 17:50:00.000	2016-01-12 19:30:00.000	12/01/2016

In [8]:
```
idata.iloc[0:3,10:20]
```

Out[8]:

	FIR Type	FIR_Stage	Complaint_Mode	CrimeGroup_Name	CrimeHead_Name	Latitude	Longitude	ActSection	IOName	K
0	Non Heinous	Dis/Acq	Written	POCSO	Others	0.0	0.0	PROTECTION OF CHILDREN FROM SEXUAL OFFENCES AC...	R S BIRADAR (PI)	189
1	Non Heinous	Convicted	Sue-moto by Police	KARNATAKA POLICE ACT 1963	Street Gambling (87)	0.0	0.0	KARNATAKA POLICE ACT, 1963 U/s: 87	G.H.KUPPI (PSI)	133
2	Non Heinous	Convicted	Sue-moto by Police	KARNATAKA POLICE ACT 1963	Gambling - Matka (78 Class C)	0.0	0.0	KARNATAKA POLICE ACT, 1963 U/s: 78(3)	S G HELVAR (ASI)	127

In [9]:
```
idata.iloc[0:3,20:30]
```

Out[9]:

	IOAssigned_Date	Internal_IO	Place of Offence	Distance from PS	Beat_Name	Village_Area_Name	Male	Female	Boy	Girl
0	NaN	42900007	KAMATAGI BUS STAND, KAMATAGI BUS STAND	WEST FROM PS 12 KM	RURAL BEAT NO 13	KAMATAGI	0	0	0	1
1	NaN	123600010	RAKKASAGI VILLEGE IN FRONT MOUNESHWAR TEMPEL, ...	WEST FROM PS 2 KM	RURAL BEAT NO 6	SULEBAVI	0	0	0	0
2	NaN	124000015	RAKKASAGI VILLAEG BUS STAND, RAKKASAGI VILLAEG...	EAST FROM PS 3 KM	RURAL BEAT NO 6	SULEBAVI	0	0	0	0

In [10]:
```
idata.iloc[0:3,30:42]
```

Out[10]:

	Age 0	VICTIM COUNT	Accused Count	Arrested Male	Arrested Female	Arrested Count\tNo.	Accused_ChargeSheeted Count	Conviction Count	FIR_ID	Unit_ID	Cri
0	0	0	1	1	0	1	1	0	2016000002	1245	10470124520
1	0	0	5	5	0	5	5	2	2016000003	1245	10470124520
2	0	0	1	1	0	1	1	0	2016000004	1245	10470124520

In [11]:
```
idata.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1694191 entries, 0 to 1694190
Data columns (total 41 columns):
 #   Column                        Dtype
---  ------                        -----
 0   District_Name                 object
 1   UnitName                      object
 2   FIRNo                         object
 3   RI                            int64
 4   Year                          int64
 5   Month                         int64
 6   Offence_From_Date             object
 7   Offence_To_Date               object
 8   FIR_Reg_DateTime              object
 9   FIR_Date                      object
 10  FIR Type                      object
 11  FIR_Stage                     object
 12  Complaint_Mode                object
 13  CrimeGroup_Name               object
 14  CrimeHead_Name                object
 15  Latitude                      float64
 16  Longitude                     float64
 17  ActSection                    object
 18  IOName                        object
 19  KGID                          object
 20  IOAssigned_Date               object
 21  Internal_IO                   int64
 22  Place of Offence              object
 23  Distance from PS              object
 24  Beat_Name                     object
 25  Village_Area_Name             object
 26  Male                          int64
 27  Female                        int64
 28  Boy                           int64
 29  Girl                          int64
 30  Age 0                         int64
 31  VICTIM COUNT                  int64
 32  Accused Count                 int64
 33  Arrested Male                 int64
 34  Arrested Female               int64
 35  Arrested Count     No.            int64
 36  Accused_ChargeSheeted Count   int64
 37  Conviction Count              int64
 38  FIR_ID                        int64
 39  Unit_ID                       int64
 40  Crime_No                      int64
dtypes: float64(2), int64(19), object(20)
memory usage: 530.0+ MB
```

In [12]:
```
idata.columns
```

Out[12]:
```
Index(['District_Name', 'UnitName', 'FIRNo', 'RI', 'Year', 'Month',
       'Offence_From_Date', 'Offence_To_Date', 'FIR_Reg_DateTime', 'FIR_Date',
       'FIR Type', 'FIR_Stage', 'Complaint_Mode', 'CrimeGroup_Name',
       'CrimeHead_Name', 'Latitude', 'Longitude', 'ActSection', 'IOName',
       'KGID', 'IOAssigned_Date', 'Internal_IO', 'Place of Offence',
       'Distance from PS', 'Beat_Name', 'Village_Area_Name', 'Male', 'Female',
       'Boy', 'Girl', 'Age 0', 'VICTIM COUNT', 'Accused Count',
       'Arrested Male', 'Arrested Female', 'Arrested Count\tNo.',
       'Accused_ChargeSheeted Count', 'Conviction Count', 'FIR_ID', 'Unit_ID',
       'Crime_No'],
      dtype='object')
```

In [13]:
```
df = idata[['District_Name','FIR_Reg_DateTime']]
```

In [14]:
```
df.head()
```

Out[14]:

	District_Name	FIR_Reg_DateTime
0	Bagalkot	2016-01-05 11:00:00.000
1	Bagalkot	2016-01-12 19:00:00.000
2	Bagalkot	2016-01-12 19:30:00.000
3	Bagalkot	2016-01-15 14:00:00.000
4	Bagalkot	2016-01-18 19:30:00.000

In [15]:
```
df.tail()
```

Out[15]:

	District_Name	FIR_Reg_DateTime
1694186	Yadgir	2024-01-11 21:30:00.000
1694187	Yadgir	2024-01-29 19:30:00.000
1694188	Yadgir	2024-02-07 17:45:00.000
1694189	Yadgir	2024-02-24 17:00:00.000
1694190	Yadgir	2024-02-28 18:30:00.000

In [16]:
```
df.isnull().sum()
```

Out[16]:
```
District_Name       0
FIR_Reg_DateTime    0
dtype: int64
```

In [17]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1694191 entries, 0 to 1694190
Data columns (total 2 columns):
 #   Column            Dtype 
---  ------            ----- 
 0   District_Name     object
 1   FIR_Reg_DateTime  object
dtypes: object(2)
memory usage: 25.9+ MB
```

In [18]:
```
df.FIR_Reg_DateTime = pd.to_datetime(df.FIR_Reg_DateTime)
```

```
C:\Users\ASUS\AppData\Local\Temp\ipykernel_9744\3727758170.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  df.FIR_Reg_DateTime = pd.to_datetime(df.FIR_Reg_DateTime)
```

In [19]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1694191 entries, 0 to 1694190
Data columns (total 2 columns):
 #   Column            Dtype 
---  ------            ----- 
 0   District_Name     object
 1   FIR_Reg_DateTime  datetime64[ns]
dtypes: datetime64[ns](1), object(1)
memory usage: 25.9+ MB
```

In [20]:
```
df.head()
```

Out[20]:

	District_Name	FIR_Reg_DateTime
0	Bagalkot	2016-01-05 11:00:00
1	Bagalkot	2016-01-12 19:00:00
2	Bagalkot	2016-01-12 19:30:00
3	Bagalkot	2016-01-15 14:00:00
4	Bagalkot	2016-01-18 19:30:00

In [21]:
```
df.tail()
```

Out[21]:

	District_Name	FIR_Reg_DateTime
1694186	Yadgir	2024-01-11 21:30:00
1694187	Yadgir	2024-01-29 19:30:00
1694188	Yadgir	2024-02-07 17:45:00
1694189	Yadgir	2024-02-24 17:00:00
1694190	Yadgir	2024-02-28 18:30:00

In [22]:
```
df.columns
```

Out[22]:
```
Index(['District_Name', 'FIR_Reg_DateTime'], dtype='object')
```

In [23]:
```
df.index = pd.DatetimeIndex(df.FIR_Reg_DateTime)
```

In [24]:
```
df.head()
```

Out[24]:

FIR_Reg_DateTime	District_Name	FIR_Reg_DateTime
2016-01-05 11:00:00	Bagalkot	2016-01-05 11:00:00
2016-01-12 19:00:00	Bagalkot	2016-01-12 19:00:00
2016-01-12 19:30:00	Bagalkot	2016-01-12 19:30:00
2016-01-15 14:00:00	Bagalkot	2016-01-15 14:00:00
2016-01-18 19:30:00	Bagalkot	2016-01-18 19:30:00

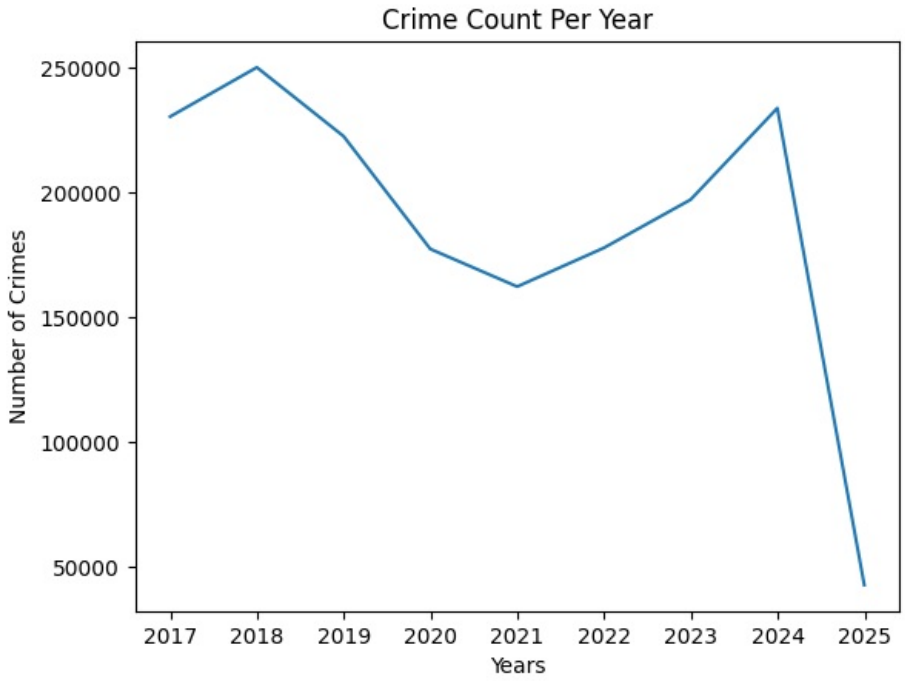
In [25]:
```
df.tail()
```

Out[25]:

FIR_Reg_DateTime	District_Name	FIR_Reg_DateTime
2024-01-11 21:30:00	Yadgir	2024-01-11 21:30:00
2024-01-29 19:30:00	Yadgir	2024-01-29 19:30:00
2024-02-07 17:45:00	Yadgir	2024-02-07 17:45:00
2024-02-24 17:00:00	Yadgir	2024-02-24 17:00:00
2024-02-28 18:30:00	Yadgir	2024-02-28 18:30:00

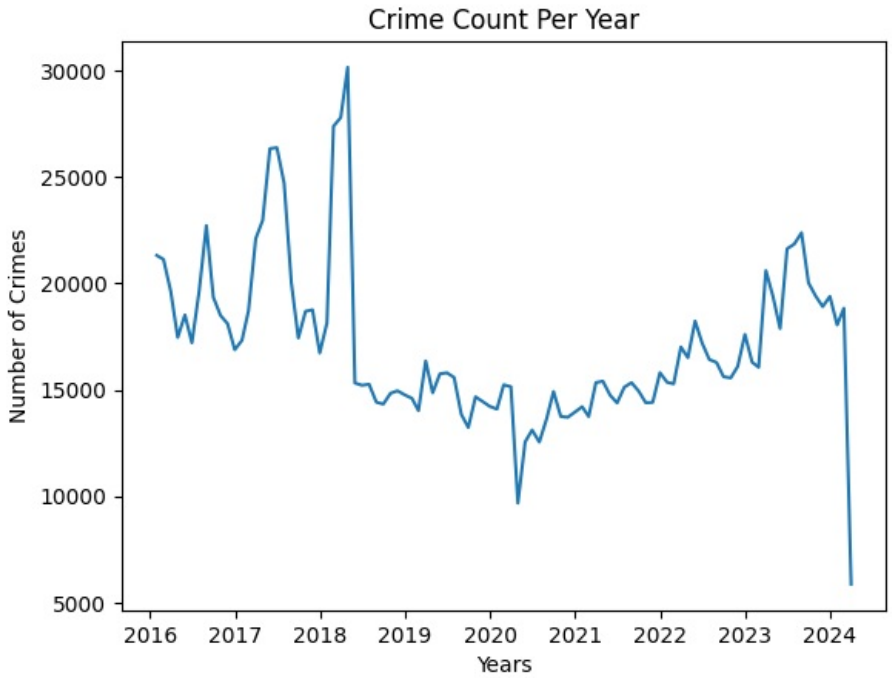
In [26]:
```
plt.plot(df.resample('Y').size())
plt.title("Crime Count Per Year")
plt.xlabel("Years")
plt.ylabel("Number of Crimes")
```

Out[26]:
```
Text(0, 0.5, 'Number of Crimes')
```



In [27]:
```
plt.plot(df.resample('M').size())
plt.title("Crime Count Per Year")
plt.xlabel("Years")
plt.ylabel("Number of Crimes")
```

Out[27]:
```
Text(0, 0.5, 'Number of Crimes')
```



In [28]:
```
df_prophet = pd.DataFrame(df.resample('M').size().reset_index())
```

In [29]:
```
df_prophet.columns =['Date','Crime Count']
```

In [30]:
```
df_prophet
```

Out[30]:

	Date	Crime Count
0	2016-01-31	21310
1	2016-02-29	21124
2	2016-03-31	19629
3	2016-04-30	17458
4	2016-05-31	18514
...	...	...
94	2023-11-30	18906
95	2023-12-31	19385
96	2024-01-31	18045
97	2024-02-29	18831
98	2024-03-31	5868

99 rows × 2 columns

In [31]:
```
df_prophet.shape
```

Out[31]:
```
(99, 2)
```

In [32]:
```
df_prophet=df_prophet.rename(columns={'Date':'ds','Crime Count':'y'})
```

In [33]:
```
df_prophet
```

Out[33]:

	ds	y
0	2016-01-31	21310
1	2016-02-29	21124
2	2016-03-31	19629
3	2016-04-30	17458
4	2016-05-31	18514
...	...	...
94	2023-11-30	18906
95	2023-12-31	19385
96	2024-01-31	18045
97	2024-02-29	18831
98	2024-03-31	5868

99 rows × 2 columns

In [34]:
```
from prophet import Prophet
```

In [35]:
```
m = Prophet()
m.fit(df_prophet)
```

```
17:50:24 - cmdstanpy - INFO - Chain [1] start processing
17:50:24 - cmdstanpy - INFO - Chain [1] done processing
```

Out[35]:
```
<prophet.forecaster.Prophet at 0x269ece71350>
```

In [36]:
```
pred=m.make_future_dataframe(periods=24,freq='M')
forcast = m.predict(pred)
```

In [37]:
```
forcast
```

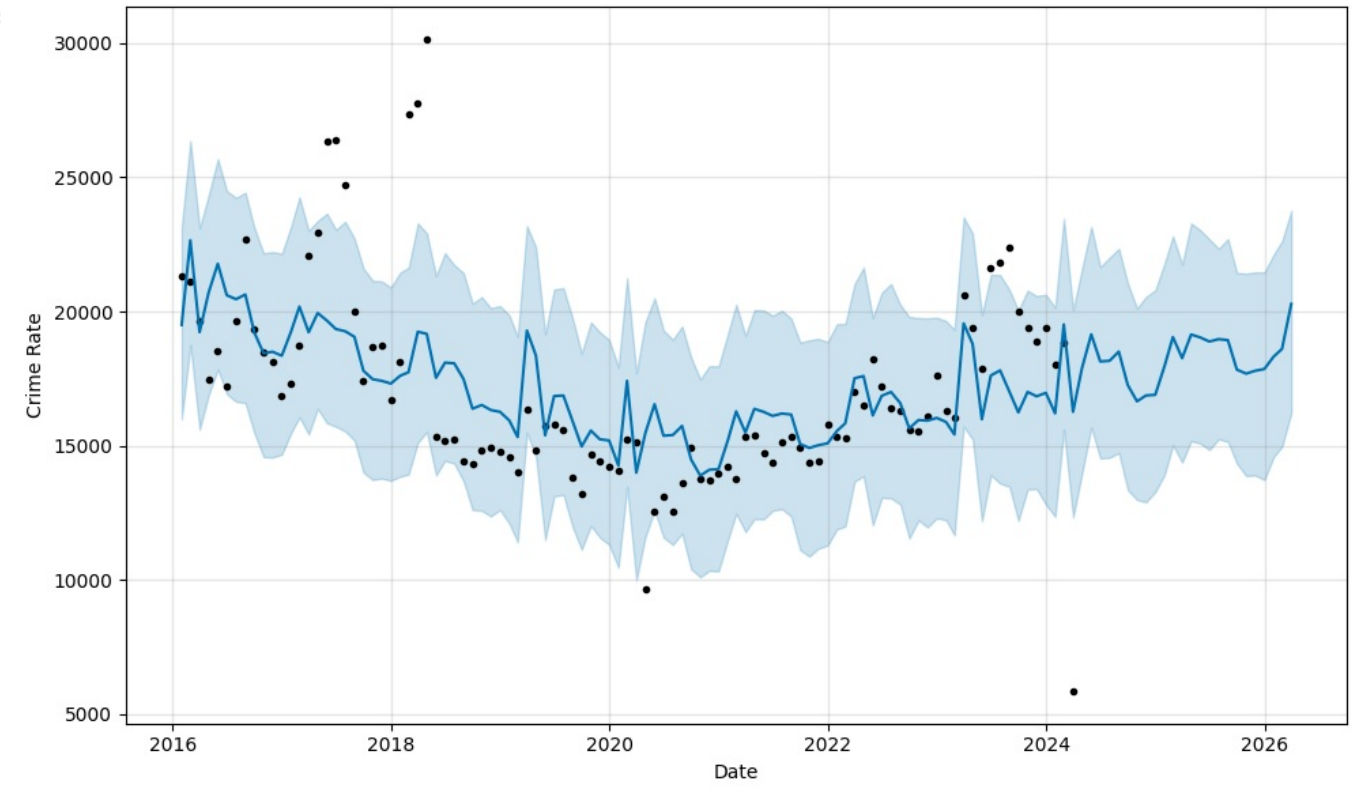
Out[37]:

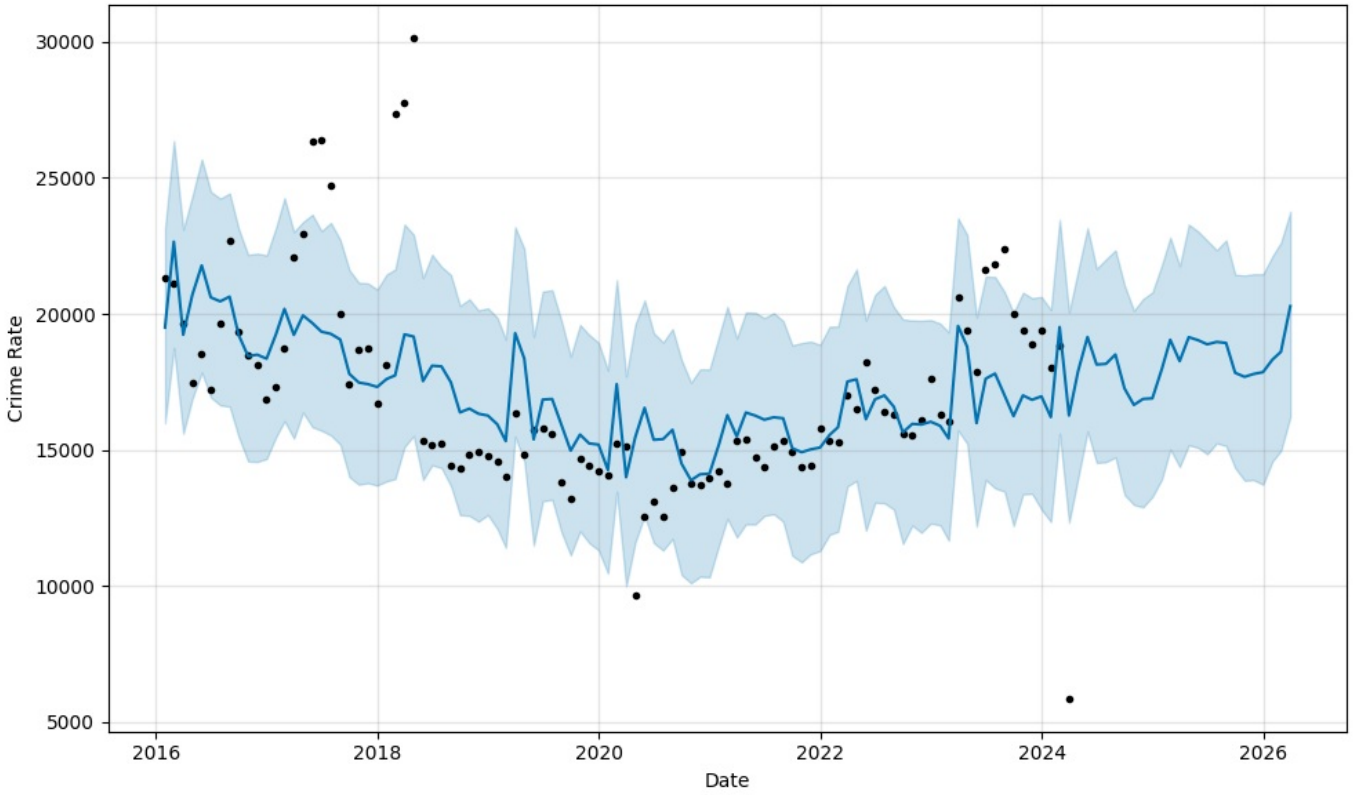
	ds	trend	yhat_lower	yhat_upper	trend_lower	trend_upper	additive_terms	additive_terms_lower	additive_t
0	2016-01-31	20747.069752	15985.662766	23151.329089	20747.069752	20747.069752	-1244.973367	-1244.973367	-
1	2016-02-29	20643.101129	18756.734310	26363.407770	20643.101129	20643.101129	2011.102724	2011.102724	
2	2016-03-31	20531.962256	15605.138575	23101.657068	20531.962256	20531.962256	-1296.732099	-1296.732099	-
3	2016-04-30	20424.408507	16885.623195	24330.822162	20424.408507	20424.408507	274.407228	274.407228	
4	2016-05-31	20313.269634	17847.178579	25685.399041	20313.269634	20313.269634	1469.870756	1469.870756	
...	...	...	...	...	...	...	...	...	...
118	2025-11-30	18721.893736	13898.666158	21462.749992	18426.796046	19044.916994	-928.507116	-928.507116	
119	2025-12-31	18780.687154	13729.614774	21463.652964	18455.318604	19125.905598	-919.409908	-919.409908	
120	2026-01-31	18839.480573	14583.319944	22126.368654	18493.079996	19213.319313	-518.256007	-518.256007	
121	2026-02-28	18892.584305	14971.742330	22627.446052	18528.273951	19291.008328	-284.801252	-284.801252	
122	2026-03-31	18951.377723	16212.655446	23762.481217	18564.984694	19390.680849	1334.798852	1334.798852	

123 rows × 16 columns

In [38]:
```
m.plot(forcast,xlabel="Date",ylabel="Crime Rate")
```

Out[38]:





In [40]:
```
import json
```

In [42]:
```
import json
from prophet.serialize import model_to_json, model_from_json

with open('prophet_model.json', 'w') as fout:
    json.dump(model_to_json(m), fout)  # Save model
```

In [43]:
```
with open('prophet_model.json', 'r') as fin:
    m1 = model_from_json(json.load(fin))  # Load model
```

In [44]:
```
x = int(input("Enter Numbers Months to forecast"))
```

In [45]:
```
pred = m1.make_future_dataframe(periods=x ,freq = "M")
forcast = m1.predict(pred)
```

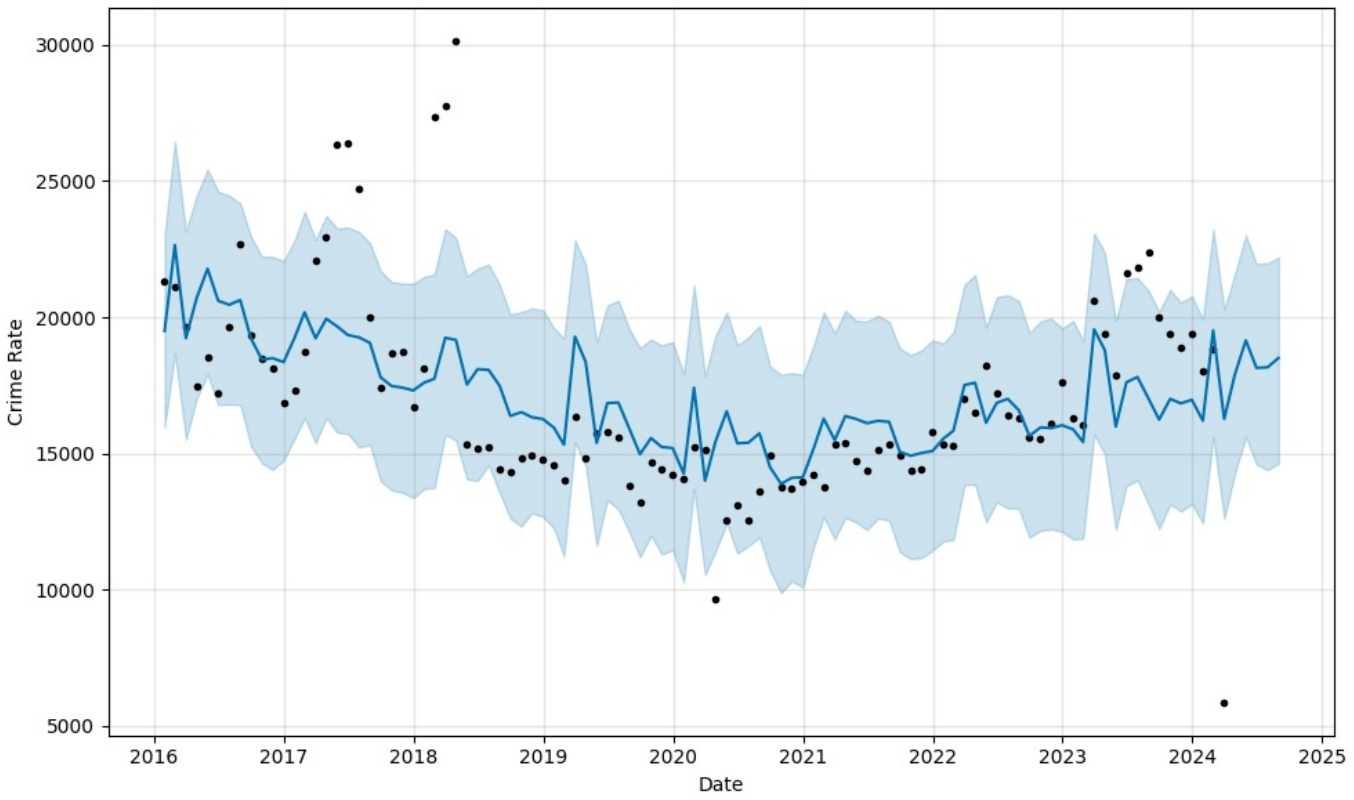
In [46]:
```
forcast
```

Out[46]:

	ds	trend	yhat_lower	yhat_upper	trend_lower	trend_upper	additive_terms	additive_terms_lower	additive_t
0	2016-01-31	20747.069752	15953.992520	23019.411931	20747.069752	20747.069752	-1244.973367	-1244.973367	-
1	2016-02-29	20643.101129	18683.322187	26450.284568	20643.101129	20643.101129	2011.102724	2011.102724	
2	2016-03-31	20531.962256	15515.963081	23156.147349	20531.962256	20531.962256	-1296.732099	-1296.732099	-
3	2016-04-30	20424.408507	17011.988140	24456.835822	20424.408507	20424.408507	274.407228	274.407228	
4	2016-05-31	20313.269634	17906.226406	25430.215395	20313.269634	20313.269634	1469.870756	1469.870756	
...	...	...	...	...	...	...	...	...	...
99	2024-04-30	17623.784412	14265.182195	21591.915196	17622.951351	17625.060511	274.407228	274.407228	
100	2024-05-31	17682.577830	15610.092553	23011.546648	17677.437894	17688.843487	1469.870756	1469.870756	
101	2024-06-30	17739.474686	14597.432624	21955.885619	17727.596423	17753.704491	402.336072	402.336072	
102	2024-07-31	17798.268104	14392.844766	21991.325904	17778.005385	17821.167231	367.795397	367.795397	
103	2024-08-31	17857.061522	14629.457789	22205.121339	17827.525084	17891.544262	651.348934	651.348934	

104 rows × 16 columns

In [47]:
```
figure = m1.plot(forcast, xlabel='Date', ylabel='Crime Rate')
```



In [ ]: