Predictive Puzzles

Unravelling Crime Trends with ARIMA & SARIMA Analysis in a Crime Series

PROBLEM STATEMENT:

An Analysis of crime against general cases in India over the period of 2001 to 2012, that predicts the crime rate over the year using the ARIMA & SARIMA Models. The two model's output predicted with the chance of the crime.

FUNCTIONAL REQUIREMENT:

1. Data Collection
2. Data processing
3. Training & Testing
4. Modeling
5. Predicting

SYSTEM COMPONENTS:

In your provided code, there are several components (functions and modules) that work together to accomplish the overall task. Here's a list of the key system components (modules) in your code:

1. **Libraries:**

- **`pandas`:** Used for data manipulation and analysis.
- **`matplotlib.pyplot`:** Used for creating visualizations.
- **`statsmodels.tsa.arima.model.ARIMA`**: AutoRegressive Integrated Moving Average model from Statsmodels.
- **`statsmodels.tsa.statespace.sarimax.SARIMAX`:** Seasonal AutoRegressive Integrated Moving Average with eXogenous regressors model from Statsmodels.
- **`Flask`:** A web framework for creating web applications in Python.
- **`render_template_string` from Flask:** Used to render HTML templates.

2. **Loading Data:**

- **`pd.read_csv`:** Reads data from a CSV file into a Pandas DataFrame.

3. **ARIMA Model Fitting Function:**

- **`fit_arima(series)`:** Function to fit an ARIMA model to a time series.

4.**SARIMA Model Fitting Function:**

- **`fit_sarima(series)`:** Function to fit a SARIMA model to a time series.

5. **Function to Predict Crime Rate:**

- **`predict_crime_rate(model, steps)`:** Function to predict future crime rates using a fitted time series model.

6. **Flask Web Application:**

- **`Flask(__name__)`:** Creates a Flask web application instance.

7. **Display Table Function:**

- **`@app.route('/')`:** Decorator defining the route for the main page.
- **`display_table()`:** Function that handles user input, filters data, fits ARIMA and SARIMA models, predicts future crime rates, and displays results in an HTML template.

8. **Running the Flask App:**

- **`if __name__ == '__main__':`:** Checks if the script is the main module and runs the Flask app with debugging enabled.

These components work together to create a web application that takes user input, analyses crime data using ARIMA and SARIMA models, and displays the results on a web page.

DISCLAIMAR:

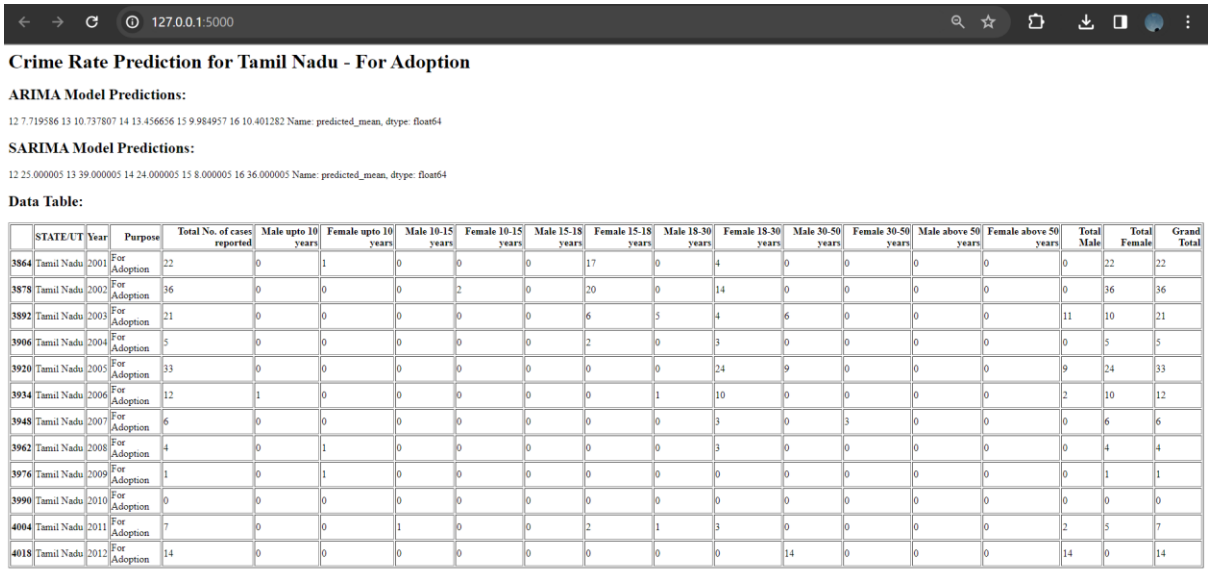
This is just a prediction it may not result in original cases , and the data set details are not verified its available in Kaggle site for ML purpose and training & result of Time series model

OUTPUT:

The List of [State/UT] & Purpose is listed in the document so you can go through and check out the prediction

```
C:\Users\saini\OneDrive\Desktop\sai>py cri1.py
 * Serving Flask app 'cri1'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 137-243-024
Enter the State/UT: Tamil Nadu
Enter the Purpose: For Adoption
```

```
           * * *

Machine precision = 2.220D-16
 N =            5     M =           10
 This problem is unconstrained.

At X0         0 variables are exactly at the bounds

At iterate    0    f= -0.00000D+00    |proj g|=  0.00000D+00

           * * *

Tit   = total number of iterations
Tnf   = total number of function evaluations
Tnint = total number of segments explored during Cauchy searches
Skip  = number of BFGS updates skipped
Nact  = number of active bounds at final generalized Cauchy point
Projg = norm of the final projected gradient
F     = final function value

           * * *

   N    Tit     Tnf  Tnint  Skip  Nact     Projg        F
    5      0      1      0     0     0   0.000D+00  -0.000D+00
  F =  -0.0000000000000000
```



127.0.0.1:5000

Crime Rate Prediction for Tamil Nadu - For Adoption

ARIMA Model Predictions:

12 7.719586 13 10.737807 14 13.456656 15 9.984957 16 10.401282 Name: predicted_mean, dtype: float64

SARIMA Model Predictions:

12 25.000005 13 39.000005 14 24.000005 15 8.000005 16 36.000005 Name: predicted_mean, dtype: float64

Data Table:

	STATE/UT	Year	Purpose	Total No. of cases reported	Male upto 10 years	Female upto 10 years	Male 10-15 years	Female 10-15 years	Male 15-18 years	Female 15-18 years	Male 18-30 years	Female 18-30 years	Male 30-50 years	Female 30-50 years	Male above 50 years	Female above 50 years	Total Male	Total Female	Grand Total
3864	Tamil Nadu	2001	For Adoption	22	0	1	0	0	0	17	0	4	0	0	0	0	0	22	22
3878	Tamil Nadu	2002	For Adoption	36	0	0	0	2	0	20	0	14	0	0	0	0	0	36	36
3892	Tamil Nadu	2003	For Adoption	21	0	0	0	0	0	6	5	4	6	0	0	0	11	10	21
3906	Tamil Nadu	2004	For Adoption	5	0	0	0	0	0	2	0	3	0	0	0	0	0	5	5
3920	Tamil Nadu	2005	For Adoption	33	0	0	0	0	0	0	0	24	9	0	0	0	9	24	33
3934	Tamil Nadu	2006	For Adoption	12	1	0	0	0	0	0	1	10	0	0	0	0	2	10	12
3948	Tamil Nadu	2007	For Adoption	6	0	0	0	0	0	0	0	3	0	3	0	0	0	6	6
3962	Tamil Nadu	2008	For Adoption	4	0	1	0	0	0	0	0	3	0	0	0	0	0	4	4
3976	Tamil Nadu	2009	For Adoption	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1
3990	Tamil Nadu	2010	For Adoption	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4004	Tamil Nadu	2011	For Adoption	7	0	0	1	0	0	2	1	3	0	0	0	0	2	5	7
4018	Tamil Nadu	2012	For Adoption	14	0	0	0	0	0	0	0	0	14	0	0	0	14	0	14

REFERENCE:

1. https://legaldesire.com/an-analysis-of-crime-against-women-in-india/
2. https://www.kaggle.com/datasets/shishir349/indian-crime-analysis