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Crime Prediction and Analysis

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Abstract: Crimes are treacherous social problems which are faced worldwide. It is the most serious and predominant issue of our society. It affects various key features bound to the society and an individual's life like the quality of life, reputation, economic growth and societal safety. With the advancement of technology there is an enormous growth in the crime rate. There are laws that have been enforced to take preventive measures but there is a need for advanced approaches for protecting the society and the individuals in the society. Hence analyzing of crime helps in detecting the patterns and trends in crime. The real time crime predictions will be a helping hand to reduce crime rate. Various visualization approaches and algorithms are used in this study to anticipate the distribution of crime in a given area. This paper's pre-processed dataset was obtained from Kaggle. After that, the system is trained using the ARIMA model. The next step is Visualization of data after which the result is predicted after analyzing the data with many machine learning calculations and modules.
Keywords: social problems, enormous, Arima model, Kaggle, Machine learning-modules.

I. INTRODUCTION

Crime is a very old concept which has moved on in society from generation to generation. Nobody is safe today. Criminals are employing scientific procedures to commit crimes as science and technology evolve, and authorities have been surprised by criminals' increased knowledge as society advances. Many crimes are perpetrated for the purpose of obtaining money or property wealth, with the most common being family feuds over property allocation. It is claimed to be a widespread societal issue that has an impact on not just a society's quality of life but also its economic progress. It is focused as major issue that has a direct impact on an individual's quality of life as well as indirect societal consequences.

With the rapid increase of crimes and the types of crimes, researchers are finding a strong connection in the various features affecting the crime like the geographic features, age, gender and many more yet to come into picture. Despite the fact that crimes can happen anywhere, it is normal for criminals to focus their efforts on regions where they are most familiar and at ease.

We seek to improve societal awareness by giving an advanced approach to identifying criminal hotspots and determining the nature, location, and time of crimes committed. Furthermore, having such a system in place would assist police in taking proactive actions in preventing and solving crimes at a far faster rate by allowing for crime prediction and prevention.

Various types of crimes are discussed here and focus on their intensities in the highest city in the highest year is put forward with machine learning concepts for the societal and police benefits in solving the crime. These crimes are represented in different visualization techniques like bar graphs, pie charts to get a clear picture about the crime.

II. RELATED WORK

The authors published Predicting Crime and Other Uses of Neural Networks in Police Decision Making in 2021. Steven Walczak looks at the current research on using Neural Networks for crime predictions and other police decision- making problems. Future study should look into how NN might be used to improve intermediate predictions, possibly by using temporal geographical cues.

The authors Wajiha Safat, Sohail Asghar, (Member, IEEE), and Saira Safat published Empirical Analysis for Crime Prediction and Forecasting Using Machine Learning and Deep Learning Techniques in 2021. Leeb Gillani also discusses how the inability to analyse complicated data from bigdata impedes accurate crime prediction and forecasting. The project will be enhanced through the use of satellite picture data and the application of new technologies.

The writers Linga Akhila Sri, Kalluri Manvitha, Gorantla Amulya, Ikkurthi Sai Sanjuna4, V. Pavani published FBI Crime Analysis and Prediction Using Machine Learning in the year 2020. The goal of this project is to evaluate a dataset containing a variety of crimes and forecast the types of crimes that may occur in a given place. The data should be updated utilising current trends such as web and apps for even better results.

The authors Krishnendu S.G, Lakshmi P.P, Nitha L released Crime Analysis and Prediction using Optimized K-Means Algorithm in 2020, which focuses on forecasting the regions with greater crime rates and age groups with more or less criminal tendencies. The findings of a criminal investigation can be used to make decisions.

Telugu Maddileti, Vaddemani Sai Madhav, K V Sai Sashank,G.Shriphad Rao's book Crime Data Analysis Using Machine Learning Models, published in 2020, uses a crime data set to forecast the types of crimes in a certain area, which aids in speeding up the classification of cases and proceeding accordingly. More data will be obtained in the future, and computer capabilities will be improved, allowing for the development of more efficient models.

Ae Chun, Venkata Avinash Paturu, Shengcheng Yuan, Rohit Pathak, Vijay Atluri, and Nabil R. Adam's project, Crime Prediction Model using Deep Neural Networks, was published in 2019. It investigates the feasibility of using machine learning techniques, specifically neural networks, to make predictions on criminal behaviour based on the history of crimes.

Gaurav Hajela, Dr.Meenu Chawla, and Dr.Akhtar Rasool's paper A Clustering Based Hotspot Identification Approach For Crime Prediction, published in 2018, shows how a spatiotemporal crime prediction technique based on machine learning and 2-Dimensional Hotspot analysis is presented. To accomplish clustering, the model can be expanded to include various clustering algorithms. For better results, a wise split method can be suggested.

Hitesh Kumar Reddy released Crime Prediction and Monitoring Framework Based on Spatial Analysis in 2018. Various visualisation techniques and Machine Learning algorithms are used to anticipate the crime distribution throughout an area, according to Toppi Reddy, Bhavna Sainia, and Ginika Mahajana. There is a plan to improve the accuracy of the crime statistics by using variousclassification methods.

Alkesh Bharati, Dr. Sarvanaguru RA.K. published CrimePrediction and Analysis Using Machine Learning (IRJET) in2018. The goal of this research is to examine a dataset that contains a variety of crimes that could occur in the future depending on a variety of factors. More datasets can becollected in the future, and more efficient models can be constructed to work faster.

III. PROPOSED APPROACH

The proposed approach is divided into two phases:

1) *Training Phase:* A set of labeled data sets i.e. Crime dataset are imported and are used as an input for further processing. The various steps involved are as follows:
a) *Pre-processed Data:* The first step of the machine learning approach is to pre-process the data to remove all the unnecessary special characters to train the data. But in this, we have retrieved a pre-processed data from Kaggle which deletes this process.
b) *Feature Selection:* In the data set given we choose the features that exhibit the boldness of crime that can be easily predicted with these keywords for example age, sex, locality. Feature selection is done which can be useful to build the model. In this we are selecting month, year, location, crime type as our main feature.
c) *Arima Model:* A type of statistical models for analysing and forecasting time series data is the Autoregressive Integrated Moving Average Model. It conforms to conventional data structures and hence provides a simple yet effective way for forecasting, hence by this model we can use analyse the data and predict the area in which this rime may probably occur with the features selected.
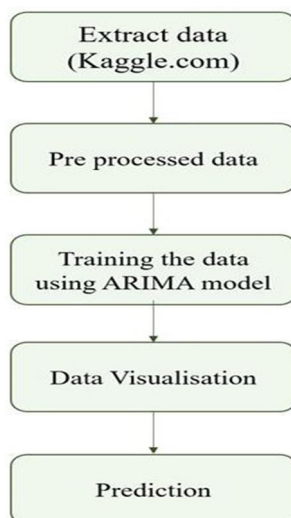

Figure 1. Process flow

2) *Visualization Phase:* Data visualization is a valuable tool for determining a qualitative knowledge. Exploring and extracting data from a dataset can help you find trends, outliers, and other information. Data visualization's main purpose is to use statistical plots and graphs to communicate data in a clear and effective way. This project produces crime density maps, which aid crime analysts in analyzing crime patterns. It is critical to understand criminal activity patterns. We discover that crime happens in specific regions, and examining them using maps and geographical data aids in the comprehension of crime patterns. We present a technique in this research for viewing and predicting previous crime data on map.

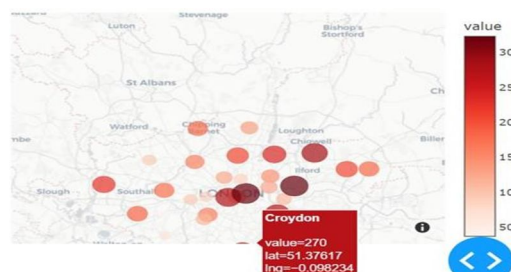a) *Visualization of Crime Hotspots*

Figure 2. Visualization Of Crime Hotspots

This visualization helps to identify the crime hotspot and the number of crimes occurred based on latitude and longitude and the crime type. This gives an idea of analyzing that particular crime happening frequently, that can be helpful to solving the crime cases.
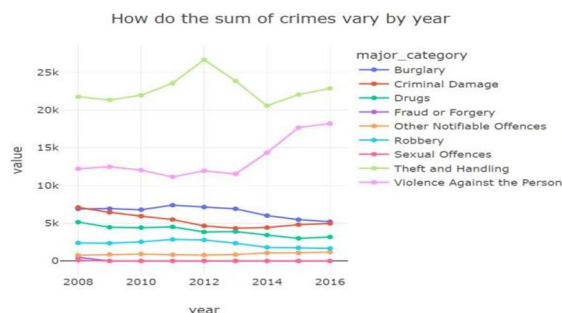
b) *Visualization of Crime types Year wise*

Figure 3. Crimes vary by year

This shows how different crimes vary by year, in this each line tells the major crime category and in which year it is high and low and also the values of crime occurrence. This helps in assuming the crime trends.
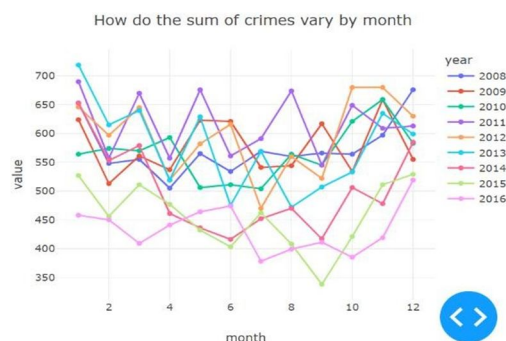
c) *Visualization of Crime types Month wise*

Figure 4. Crimes vary by month

This shows how different crimes vary by month, in this each line tells in which month the crime is high and low and also the values of crime occurrence. This helps in assuming the crime trends.

d) *Visualization of different crime types based on Postcode of a city Using Pie chart*
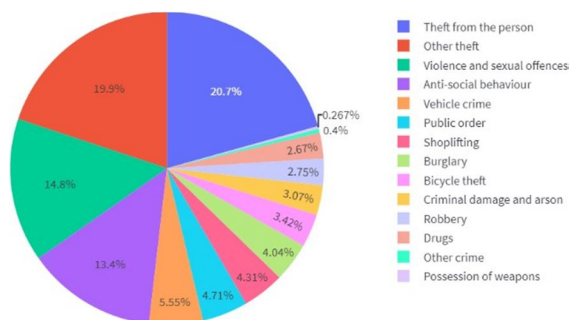

Figure 5. Percentage of crime types

The pie chart represents the percentage of each crime type that has occurred in a particular location based on latitude and longitude of the place. In this by providing the postcode it analyses and predicts the percentage of each crime type which is high, low and gives an idea of what are the possibility of crime can occur and also identify the patterns which helps in solving the crime cases.

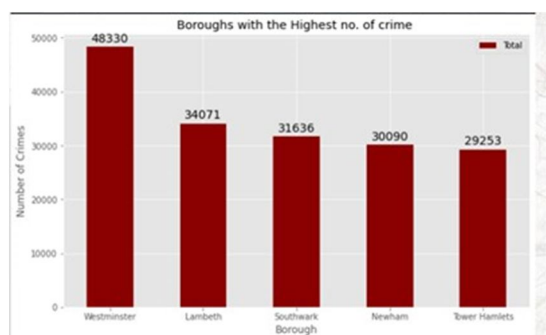*e)* *Visualizing the highest and lowest number of crimes in the boroughs.*

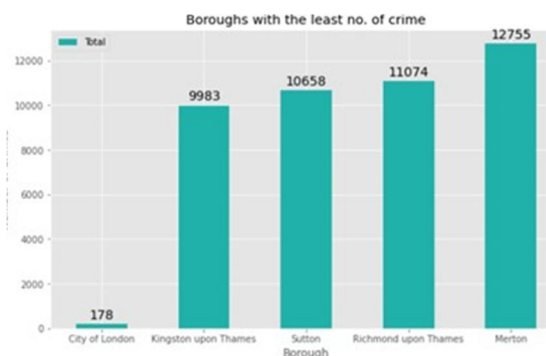Figure 6a. Boroughs with Highest No. of crimes

Figure 6b. Boroughs with Lowest No. of Crimes

The two graphs show the highest and lowest number of crimes occurred with respect to different cities or towns. The graph 'a' shows the highest number of crimes in which the Westminster borough has highest crime rate of 48330 whereas the graph 'b' shows the lowest number of crimes in which City of London has lowest crime rate of just 178.

IV. CONCLUSION

The purpose of this project is to identify the locations with highest particular crime so that the police can be given an act of hint to take proactive measures before the situation could worsen up. This model helps to analyze and predict crime. Using machine learning approaches the areas and hotspots can be predicted based on the type of crime and give the overall prediction of any crime. The paper also focuses on building this approach by importing machine learning modules, Police API and calculations of supervised learning to give an inch of advancement for the same.

REFERENCES

[1] "Crime Prediction and Analysis Using Machine Learning" Alkesh Bharati1, Dr Sarvanaguru RA. K2 Student, Dept. of Computer Science, VIT University Vellore, Tamil Nadu, India Associate Professor, Dept. of Computer Science, VIT University Vellore, Tamil Nadu, India.

[2] "Crime Analysis and Prediction using Optimized K-Means Algorithm" Krishnendu S.G, Lakshmi P.P, Nitha L PG Student, PG Student, Assistant Professor Department of Computer Science and IT, Amrita School of Arts and Sciences,Kochi Amrita Vishwa Vidhyapeetham, India.

[3] "Crime Data Analysis Using Machine Learning Models" Telugu Maddileti ,Vaddemani Sai Madhav , K V Sai Sashank ,G.Shriphad Rao Assistant Professor ECM Department, , Sreenidhi Institute of Science and Technology,Hyderabad, Telangana,INDIA-501301 , Junior Research Schlar, ECM Department , Sreenidhi Institute of Science and Technology,Hyderabad,Telangana,INDIA-501301

[4] "Crime Prediction & Monitoring Framework Based on Spatial Analysis" Hitesh Kumar Reddy ToppiReddya, Bhavna Sainia, Ginika Mahajana a School of Computing and InformationTechnology, Manipal University Jaipur, Jaipur-303007, India.

[5] "Crime Prediction Using Machine Learning Approach" Prof. Shivaprasad More, Sakshi Mench , Saloni Kuge , Hafsa Bagwan Assistant Professor, Sanjay Ghodawat University, Kolhapur, Maharashtra, India1 Research Scholars, Sanjay Ghodawat Group of Institutions, Kolhapur, Maharashtra, India.

[6] "A Clustering Based Hotspot Identification Approach For Crime Prediction" Gaurav Hajelaa, Dr. Meenu Chawlaa, Dr. Akhtar Rasoola Maulana Azad National Institute of technology, Bhopal 462023, India.

[7] "FBI Crime Analysis And Prediction Using MachineLearning" Linga Akhila Sri, Kalluri Manvitha, Gorantla Amulya,Ikkurthi Sai Sanjuna, V. Pavani, B.Tech, Department of Information Technology, Vignan's Nirula Institute of Technology & Science for Women, Peda Palakaluru, Guntur- 522009, Andhra Pradesh, India.

[8] "Predicting Crime and Other Uses of Neural Networks in Police Decision Making" Steven Walczak School of Information and Florida Center for Cybersecurity, University of South Florida, Tampa, FL, United States.

[9] "Empirical Analysis for Crime Prediction and Forecasting Using Machine Learning and Deep Learning Techniques" Wajiha Safat, Sohail Asghar, (Member, IEEE), And Saira Andleeb Gillani Department of Computer Science, COMSATS University.

[10] "Crime Prediction Model using Deep Neural Networks" Soon Ae Chun, Venkata Avinash Paturu, Shengcheng Yuan, Rohit Pathak, Vijay Atluri, Nabil R. Adam, College of Staten Island City University of New York, NY, USA.

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