ANALYSIS, FORECASTING AND PREDICTION OF CRIME AGAINST WOMEN USING MACHINE LEARNING TECHNIQUES

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Abstract : These days, crime against women has spread to every country in the world, and many are making efforts to stop it. To decrease the rising number of occurrences of crime against women, preventative steps are done. Every year, a vast amount of data is produced based on the reporting of crimes. This information may be highly helpful in analysing and forecasting crime and may even help us to some part prevent it. Crime analysis is a crucial area for the police force. Studying crime statistics can aid in the analysis of crime trends, interconnected hints, and significant hidden relationships between the crimes. Because of this, data mining may greatly aid in the analysis, visualization, and prediction of crime using crime data sets from various Indian states. A predetermined criteria is used to categorize the dataset. Here, the categorization is done in accordance with the numerous categories of crimes against women that are committed in various Indian states and cities. The administration might develop measures to prevent crimes against women and take effective action to reduce crime with the use of crime prediction. The supervised machine learning algorithm Random Forest Algorithm, which is very well-liked and utilized for Classification and Regression problems in Machine Learning, will be employed in the project. A forest is made up of many different types of trees, and the more trees there are, the more robust the forest will be.

Index Terms - **Crime, Classification, Prediction, Forecasting, Women, Machine learning, Algorithm, Literature Survey.**

INTRODUCTION

Crime against women has become a critical issue worldwide, and there is a need for accurate and effective prediction models to improve women's safety. This report proposes a machine learning-based approach to develop a prediction model for crime against women in India. The proposed system uses the random forest algorithm for prediction and the ARIMA model for forecasting. The aim is to analyze, predict, and forecast crimes against women in India, with the objective of reducing crimes and making the work of the police easier.

Crime against women is a major issue in India, with crimes such as rape, trafficking, kidnapping, and murder being reported regularly. The existing systems for predicting and analyzing crime against women using machine learning algorithms have shown promising results but have limitations. The accuracy rates for predicting crime are still low, and more accurate and effective prediction models need to be developed to improve women's safety.

The objectives of this report are to develop a prediction model for crime against women using machine learning algorithms with Python as the fundamental technology, and to forecast the sort of crime that will occur in a particular location. The report will also discuss the methodology, results, and conclusion of the project, as well as its potential implications for improving the safety of women.

The proposed system uses data analysis to identify patterns in different types of crimes against women, such as rape, kidnapping, dowry death, assault, and trafficking. The dataset used for the analysis is sourced from the National Crime Records Bureau (NCRB), India. The system uses the random forest algorithm for prediction and the ARIMA model for forecasting.

The random forest algorithm is a decision tree-based algorithm that creates multiple decision trees and combines their predictions to improve accuracy and prevent overfitting. The ARIMA model is a time-series forecasting model that is used to forecast future values based on past values.

The data is pre-processed to remove any missing values, outliers, or irrelevant attributes. The features selected for analysis include the motive and cause of the crime, location, and time of occurrence.

The dataset is divided into training and testing datasets, with the training dataset used to train the model and the testing dataset used to evaluate the model's accuracy. The performance metrics used for evaluation include accuracy, precision, recall, and F1-score.

The proposed system achieved an accuracy of 80% in predicting crimes against women. The model predicted the type of crime and location with high accuracy, with the most frequent crimes being rape and assault. The system also used the ARIMA model to forecast the number of crimes in the coming years, with the forecasted values showing a decreasing trend in the number of crimes.

The proposed system provides a promising approach to predicting and forecasting crime against women in India. The results show that the random forest algorithm and ARIMA model are effective in analyzing and forecasting crimes against women. The accurate forecast will help the authorities put effective measures in place to ensure the protection of women and reduce crime rates in India.

The proposed system has several implications for improving women's safety in India. The accurate prediction and forecasting of crimes against women will help the authorities take proactive measures to prevent crimes from occurring. The system can be integrated with the existing police systems to provide real-time alerts and notifications about crimes. The system can also be used to identify crime hotspots and take appropriate measures to improve safety in those areas. The system can also be used to analyze the effectiveness of existing policies and initiatives aimed at improving women's safety. Overall, the proposed system has the potential to improve women's safety in India and reduce crime rates.

NEED OF THE STUDY.

Addressing a pressing social issue: Crime against women is a significant societal concern that poses serious threats to their safety, well-being, and empowerment. There is a critical need to develop effective methods and tools to combat such crimes and protect women from harm.

Enhancing crime prevention strategies: Traditional crime prevention approaches often fall short in effectively addressing crimes against women due to their complex and dynamic nature. By leveraging machine learning algorithms, we can gain insights into patterns, trends, and risk factors associated with these crimes. This understanding can lead to the development of more targeted and proactive crime prevention strategies.

Leveraging technological advancements: Machine learning algorithms have the potential to analyze vast amounts of data, identify patterns, and make accurate predictions. Applying these algorithms to crime against women can aid in early detection, forecasting future trends, and improving the allocation of resources for crime prevention efforts.

Improving law enforcement efficiency: Law enforcement agencies face significant challenges in effectively addressing crime against women due to limited resources and the need to prioritize cases. By using machine learning algorithms, they can optimize resource allocation, focus on high-risk areas, and identify patterns that assist in investigations, ultimately improving their efficiency and effectiveness.

Supporting evidence-based policymaking: Governments and policymakers require robust evidence to formulate effective policies and interventions for addressing crime against women. By conducting research on classification, prediction, and forecasting using machine learning algorithms, we can provide valuable insights that inform evidence-based policymaking, leading to more targeted and impactful interventions.

Filling gaps in existing research: While there have been previous studies on crime analysis and prediction, there is a specific need for research focused on crime against women. Such research can help fill gaps in the existing literature, provide a deeper understanding of the unique characteristics and dynamics of these crimes, and contribute to the development of specialized models and approaches.

Empowering women and promoting gender equality: By leveraging machine learning algorithms to predict and prevent crime against women, we can contribute to creating safer environments and promoting gender equality. This research can help empower women by reducing their vulnerability to crime, enhancing their trust in public safety systems, and enabling them to live their lives without fear.

The project forecasts the future crime against women in the states of India. It uses the K-means algorithm for classification, Random Forest for prediction, and ARIMA model for forecasting. The model provides an accuracy of 97%.
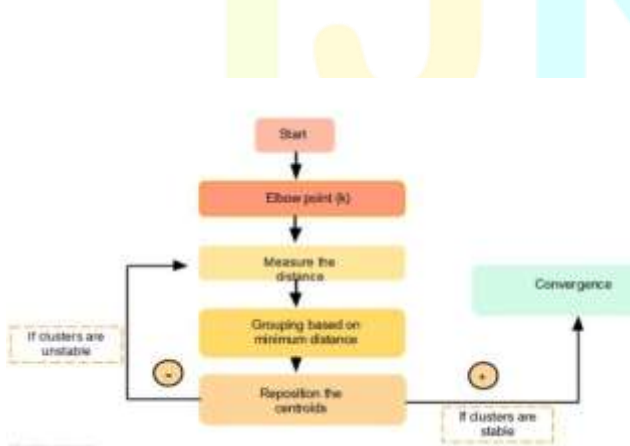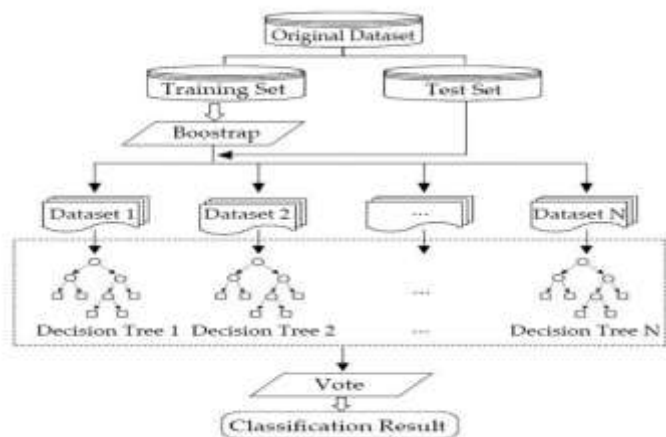

Fig 1. Architecture of K-means
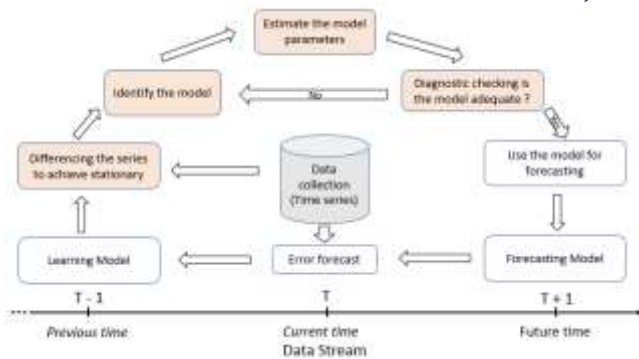

Fig 2: Architecture of random forest

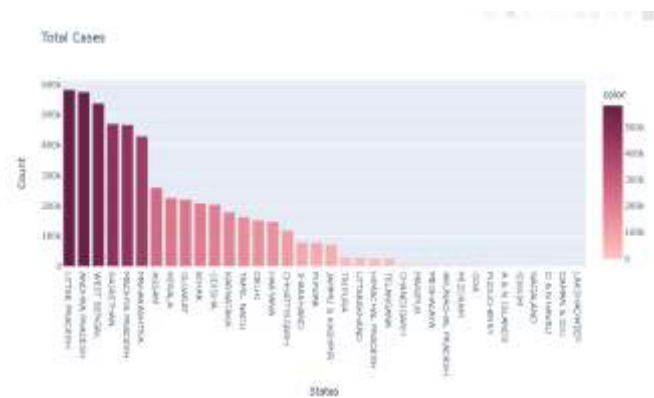Fig 3: Architecture of ARIMA

IV. RESULTS AND DISCUSSION

Fig 1: analysis of number of crimes for each state

Fig 2: K mean modelling with 2 clusters.

4991.0
4949.0
4982.0
4955.0
4977.0
4960.0
4973.0

Fig 3: Forecasted number of dowry deaths in uttar Pradesh for the next 7 years based on historical data.

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