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Crime Intention Detection Using AI DL

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ABSTRACT :

One of our society's most important problems is crime. It is the most pervasive part of our culture. It's also pervasive in society. As a result, one of the most important jobs is to prevent crime. The investigation of crimes should be done in a systematic manner. As a result of the analysis, it is critical in the detection and prevention of crime. The analysis identifies patterns in the investigation and aids in the discovery of crime trends. The main focus of this study is an examination of the effectiveness of criminal investigation. The model is intended to detect crime patterns based on inferences. The inferences are gathered from the crime scene, and the study uses these inferences to show the perpetrator's forecast. The machine learning approach can better help in the prediction and analysis of the crime. Traditional crime prediction methods rely on statistical modelling and analysis of historical crime data, which can be time-consuming and resource-intensive. With the advent of machine learning algorithms, particularly gradient boosting algorithm, crime prediction can be performed more efficiently and accurately. Gradient boosting algorithm is a machine learning algorithm that combines several weak models to form a strong model. In crime prediction, gradient boosting algorithm can be used to analyse various factors that contribute to the occurrence of crime, such as demographic and environmental variables, and create a predictive model that can identify areas or times where crime is likely to occur.

Keywords – criminal investigation , demographic

I.INTRODUCTION :

Crime prediction has a long-standing history, beginning in the early 20th century when criminologists started analyzing crime data to uncover patterns. Early methods relied heavily on statistical modeling to identify crime hotspots, allowing law enforcement to allocate resources more effectively. As computing technology advanced in the 1950s and 1960s, computer-based crime prediction models emerged, using regression analysis and other statistical methods to understand the factors contributing to crime, such as demographic and socio-economic influences. In the 1980s and 1990s, machine learning algorithms like neural networks and decision trees gained traction for crime prediction, offering a more robust approach for analyzing larger datasets and more intricate relationships between variables. Today, with the availability of vast amounts of data and the increase in computing power, machine learning algorithms, particularly gradient boosting, are widely used for crime prediction. These algorithms excel in processing complex datasets, identifying hidden patterns, and providing highly accurate predictions. The use of gradient boosting in crime prediction holds great potential, extending beyond just forecasting crime occurrences. These algorithms can also assess the risk of offenders reoffending, identify contributing factors to recidivism, and even help pinpoint potential suspects in unsolved cases. However, the implementation of these technologies must be approached responsibly to ensure fairness and avoid biases that could skew predictions. The primary aim of the proposed system is to equip law enforcement agencies with an effective tool for predicting crime occurrences in real time. By analyzing factors like demographics, location, and time, the system aims to build a predictive model that highlights areas and times with a higher likelihood of criminal activity. The system is designed to collect and preprocess data from various sources, including police reports and crime maps, ensuring that the model is built on a diverse and reliable dataset. The system's next step is selecting relevant features from the data, such as crime type, location, and time of occurrence, which will be used to train the gradient boosting algorithm. The trained model will then be validated using a hold-out dataset to test its accuracy and generalizability. Once validated, the system will be deployed in real time, allowing law enforcement agencies to predict where and when crimes are likely to happen, enabling more informed decision-making. In terms of specific objectives, the system aims to enhance the accuracy and efficiency of crime prediction, allowing law enforcement to allocate resources more effectively. By anticipating where crimes may occur, the model will help law enforcement take proactive measures to prevent crimes from happening in the first place. Additionally, the model can be instrumental in identifying potential suspects in unsolved cases by analyzing historical data for recurring patterns. The system has several key applications in law enforcement, such as optimizing patrol deployment. By identifying crime hotspots and peak times for criminal activity, law enforcement can allocate patrols more efficiently. The predictive capabilities also help law enforcement agencies allocate resources in areas most at risk, ensuring they are prepared for potential criminal activity. This proactive approach can ultimately reduce crime rates and improve the safety of neighborhoods. In addition to resource allocation, the system can be used to prevent crime by pinpointing emerging crime hotspots. By taking preventive action in these areas, such as increasing police presence or implementing community-based strategies, crime may be deterred before it escalates. Furthermore, the system can assist in identifying suspects in unsolved cases by recognizing patterns that could lead to crucial investigative leads. Another potential application of the system is in supporting ongoing investigations. The predictive model can be used to offer investigative insights, suggesting potential links between different crimes or identifying suspects based on the behavior and location patterns. This could streamline the

investigation process, making it faster and more accurate, and assist law enforcement in solving cases more efficiently. Overall, the proposed system for crime prediction using the gradient boosting algorithm holds great promise for enhancing public safety. It offers numerous use cases that can optimize law enforcement operations, improve crime prevention, and contribute to better resource allocation. As the system continues to evolve and integrate more data, its potential to aid law enforcement in proactive decision-making and improving community safety will continue to grow.

II.RELATED WORKS :

The paper "Survey of Analysis of Crime Detection Techniques Using Data Mining and Machine Learning" by Saravanan et al. discusses the use of data mining techniques to analyze crime data, transforming it into a format for future use. It highlights how various algorithms like artificial neural networks, decision trees, and genetic algorithms have been applied across diverse fields, including crime investigation. The focus is on crime analysis, which includes understanding and identifying patterns of crimes such as fraud detection, traffic violence, violent crime, web crime, and sexual offenses. It aims to improve crime investigation and detection through the use of these techniques, providing an efficient approach to addressing various crime types. In a similar vein, the paper "Grid-Based Crime Prediction Using Geographical Features" by Lin and Yen explores the limitations of traditional spatial-temporal models in predicting crime. Spatial-temporal models like Kernel Density Estimation (KDE) and Time Series are popular but only consider time or space independently, failing to account for the complex interactions that affect crime. The paper introduces empirical models, akin to machine learning models, where local knowledge and experience play crucial roles in effective crime prevention. The study argues for a holistic perspective, emphasizing the challenges in integrating various predictive models for citywide crime prevention. Another significant contribution, "Technologies of Crime Prediction: The Reception of Algorithms in Policing and Criminal Courts" by Brayne and Christin, addresses the broader implications of algorithmic tools in law enforcement. It delves into the political and social context in which these predictive systems are deployed, emphasizing that their adoption can lead to unexpected consequences, such as workplace surveillance and the displacement of discretion. The authors argue that the use of algorithms in policing and criminal courts must be scrutinized for its potential to exacerbate social and racial inequalities, raising questions about fairness and accountability in the criminal justice system. In "Machine Learning for Risk Assessment in Gender-Based Crime" by González-Prieto, the focus is on creating a hybrid model that combines traditional statistical methods with machine learning for assessing the risk of recidivism in gender-based crimes. The paper addresses the unpredictability of crime and the challenges in predicting future criminal activity, such as repeat offenses. By applying machine learning to existing data sources, such as the Spanish VioGen system, the study aims to improve the prediction of recidivism among female victims of gender violence, thereby enhancing preventive measures. The study "Economic Crime Detection Using Support Vector Machine Classification" by Krysovatyy explores the application of machine learning, specifically Support Vector Machines (SVM), in detecting economic crimes. The paper introduces a method for identifying fictitious businesses, which are often used to conceal illegal activities. The use of SVM allows for the rapid detection of these fictitious entities, providing law enforcement officers with an efficient tool to prevent economic crime. The study highlights the need for improved legislation and the importance of machine learning in combating economic fraud. The paper "Security and Privacy in Cloud Computing: Technical Review" discusses the rise of cloud computing and the associated security and privacy concerns. While cloud services offer scalability and cost-efficiency, the outsourcing of data and applications to third-party services presents significant risks. The paper reviews the literature on security and privacy issues and argues for adaptive solutions that do not conflict with cloud security objectives. It emphasizes the need for technical approaches that can address these concerns while maintaining a secure cloud environment, offering a comprehensive overview of the challenges and potential solutions. "Privacy Protection and Data Security in Cloud Computing: A Survey, Challenges, and Solutions" presents a systematic review of privacy protection frameworks in cloud computing. The paper discusses various techniques such as attribute-based encryption (ABE) and access control, highlighting their strengths and limitations. It proposes a unified framework for privacy protection, addressing challenges like multi-authority encryption, trace mechanisms, and revocation mechanisms. The paper also outlines the legal aspects of privacy protection and provides future directions for research to improve cloud security and ensure data confidentiality. In "Secure Transmission of Record After Record Linkage for Crime Detection Using AES," the focus is on securing the transmission of matched data records, particularly in crime detection scenarios. Record linkage, a technique for finding matching data from different sources, is used to identify entities across multiple datasets. The paper proposes using the AES algorithm to secure the transmission of matched records, ensuring data integrity and preventing malpractices. This approach is critical for maintaining the confidentiality and accuracy of crime-related data during investigations. Lastly, "Secure Attribute-Based Data Sharing for Resource-Limited Users in Cloud Computing" discusses the challenges of secure data sharing in cloud computing, particularly for resource-constrained devices. The paper introduces a new attribute-based encryption (ABE) scheme designed to reduce computational overhead while ensuring high security and fine-grained access control. By optimizing the computation tasks and using a Chameleon hash function for ciphertext protection, the proposed scheme enhances data security while maintaining efficiency, making it suitable for resource-limited mobile users in cloud environments. This solution addresses the ongoing challenges in achieving both security and performance in cloud-based data sharing systems.

III.PROPOSED SYSTEM :

Crime prediction is an important aspect of law enforcement and public safety. By predicting where crimes are likely to occur, law enforcement agencies can take proactive measures to prevent crime and allocate resources more efficiently. The proposed system for crime prediction using the Gradient Boosting Algorithm begins with the collection of data on crime patterns. This data can include various attributes such as location, time, and type of crimes that have occurred in the past. Obtaining this data can be done through several sources like police reports, crime databases, or other sources.

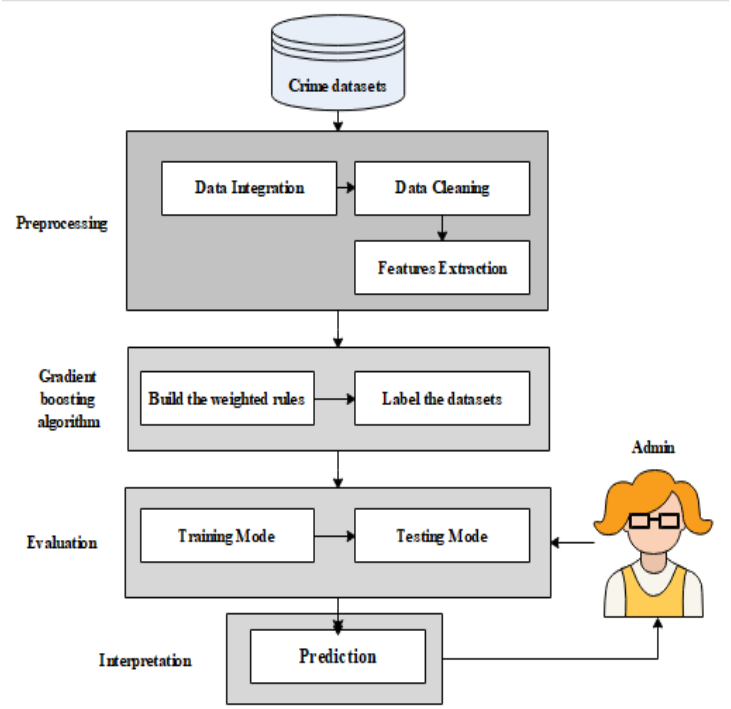

Figure 1: System Architecture of proposed system

IV. MODULES :

1.Data Collection: The crime data is collected from various sources such as police reports, crime maps, and other publicly available data sources. The data is collected in a structured format that includes relevant attributes such as crime type, location, and time of occurrence.

2.Data Pre-processing: The collected data is pre-processed to remove missing values, outliers, and other data inconsistencies. The pre-processing step includes data cleaning, data transformation, and data normalization. Feature Selection: Relevant features such as crime type, location, and time of occurrence are selected from the pre-processed data.

3.Features Selection

The feature selection step is based on the correlation analysis, feature importance ranking, and domain knowledge. Gradient Boosting Algorithm: The gradient boosting algorithm is trained on the selected features and the historical crime data. The gradient boosting algorithm is a machine learning algorithm that builds an ensemble of decision trees to predict the occurrence of crime.

4.Classification

Model Validation: The trained model is validated using a hold-out dataset to evaluate its accuracy and generalizability. The validation step includes performance metrics such as accuracy, precision, recall, and F1 score. Real-time Crime Prediction: The validated model is deployed to predict the occurrence of crime in real-time. The real-time prediction step involves integrating the trained model with a user interface that allows users to input new crime data and receive real-time crime predictions.

V.RESULTS AND DISCUSSION :

The studies reviewed highlight the effectiveness of various machine learning and data mining techniques in crime detection and prediction, showcasing advancements in both algorithmic approaches and practical applications. Key findings include improvements in crime forecasting, fraud detection, and risk assessment, with some limitations regarding the integration of these methods in real-world policing and judicial contexts. Additionally, privacy and security concerns in cloud computing remain critical, with ongoing efforts to develop adaptive, secure solutions for sensitive data management.

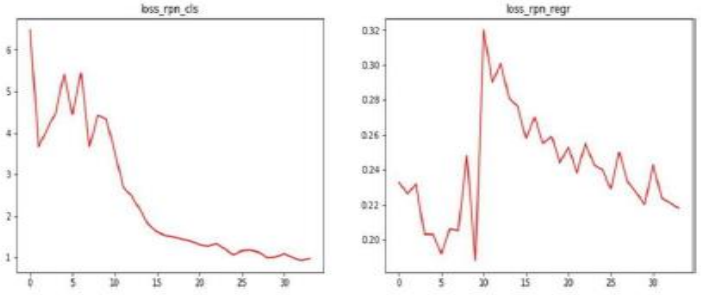

Fig 7.1: Training loss and accuracy

VI.CONCLUSION :

In conclusion, various advanced techniques, including data mining, machine learning, and encryption, have shown significant potential in improving crime detection and prevention. However, challenges remain in integrating these technologies effectively while addressing security, privacy, and ethical concerns. Future research should focus on enhancing adaptive solutions to overcome these obstacles and ensure more efficient and secure crime management systems.

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