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LITERATURE REVIEW ON CRIME DETECTION AND PREDICTION USING AIML

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Abstract:

Crime can be termed as an anomalous act and is one of the biggest and dominant problems in our society and its prevention is an important task. These days, there are huge numbers of crimes committed frequently. This called for keeping track of all the crimes and maintaining a database for some which may be used for future reference. The current problem is maintaining a proper dataset of crime and analyzing this data to help in predicting and solving crimes in future. The objective of this project is to analyze a dataset which consists of numerous crimes and predict the type of crime which may happen in future depending upon various conditions. The paper apotheosis potential gaps and future directions that can increase the correctness of crime prediction.

Keywords: ***Crime Prediction, Crime detection, Crime analysis, Face recognition, object detection, Instances learning, machine learning.***

1. INTRODUCTION

A crime is an unlawful action for which an individual can be punished by law. In the last few eras, there has been an abnormal growth in urban population which has led to the demand for a secure, hospitable, and sustainable society. With the ever-expanding growth of cities, the management of urbanization remains a major challenge for administrative authorities. Cities are stuffed, compelling governments to undertake smart city drives that would help achieve better management of infrastructure and overcome the major challenges of security, sustainability, and development. Although smart city drives have gained immense momentum with promises to increase quality of life, it does have its own challenging aspects as well. One of the major problems in smart city life is public safety. Various studies have been conducted to help in understanding the crime patterns and its relationship to the social economic development of particular regions, the human characteristics, their level of education, and family bonding. Crime investigating organizations have classified various types of crimes. The four main categories include **murders, sexual assault, robbery, harassment.**

Crime prediction is a complex problem requiring advanced analytical tools to efficiently address the trends and patterns in criminal activities. With the increase in the availability of detection mechanisms, crime data and advanced technology, researchers were provided with unique opportunities to study and research crime detection using Artificial intelligence and machine learning.

Crimes are a significant threat to humankind. There are many crimes that happen at regular intervals of time. Maybe it is increasing and spreading at a fast and vast rate. Since crimes are increasing there is a need to identify and solve the cases in a much faster way. Crime activities have been increasing at a faster rate and it is the responsibility of the police department to control and reduce crime activities.

The field of machine learning is a subset of artificial intelligence that uses statistical models and algorithms to analyze and make prognostication based on data. Machine learning algorithms have been utilized in crime prediction to identify crime data and predict future crime patterns. For example, algorithms like support vector machine, K-nearest neighbors have been trained on crime data specific cities to predict crime patterns accurately. Apart from forecasting crime patterns, these algorithms can provide valuable perception into crime trends and patterns. These capabilities allow for deploying resources and tactics to conflict crime effectively.

Artificial intelligence and machine learning algorithms have also shown promise in crime prediction. These methods have been trained on crime data with either a spatial or temporal component to correctly identify crime patterns in specific cities. For example, machine learning algorithms have been used to analyze crime data, including the time, location, and type of crime incidents. This information is used to identify potential crime hotspots and identify future crime incidents.

Another application of machine learning in crime detection is computer vision and video analysis. This technology has been used to analyze video footage from surveillance cameras to detect and classify criminal activities, such as robbery, sexual assault, murders, harassment. These algorithms have also been used to analyze crime data from multiple sources, including crime reports, social media, and police records, providing a comprehensive view of criminal activities. By automating this process, machine learning algorithms have the potential to enhance the ability to identify and respond to crime in real-time, providing a crucial tool in the fight against criminal activity.

Despite the promise of artificial intelligence and machine learning for crime detection and crime prediction, several challenges must be addressed. One of the major conflicts is the availability of high-quality crime data. Crime data can be complex to obtain, and the available data may need to be completed or reliable. Furthermore, collecting and using crime data is associated with privacy and ethical concerns. These challenges must be addressed to fully realize the potential of artificial intelligence and machine learning models. These models can be challenging to understand and interrupt, limiting their usefulness in decision-making.

In this study, we provide an immense literature review to understand the various reviews with the references and trends in crime analysis and prediction. Specifically, our paper focuses on research papers that use artificial intelligence, machine learning and its various algorithms.

2. LITERATURE REVIEW

The papers that we have taken for our research provide a comprehensive overview of recent trends in this field and offer insights into the potential applications of Artificial intelligence and machine learning for crime detection and crime prediction. By focussing on the potential of these technologies and the challenges that must be addressed, this research article contributes to the broader research community. It advances our understanding of the role of artificial intelligence and machine learning in crime detection and prediction.[1]

The paper provides an amalgamation of existing studies that utilize state-of-the-art artificial intelligence and machine learning based approaches in the realm of detecting neighborhood crime. Thereby extending the fathomable literature knowledge base. It eliminates the limitation of the scarcity of potential datasets. We have highlighted distinct publicly available datasets related to neighborhood crime detection and crime prediction that existing studies have utilized. Thereby archiving the data resources for future scholars. The purpose and the types of methods behind the different crime prediction studies and application varied in the papers we collected.[2]

On the other hand, some recent surveys have explored crime prediction methods, based on some different crime prediction factors, such as socioeconomic, spatial-temporal, demographic and geographic attributes. Attributes in crime datasets can focus on two types of attributes: location-based attributes of where the crime occurred and neighborhood information, such as unemployment rate, household income, population, etc. E.g. (Bellarmine, 2018) have dataset that combine both crime and neighborhood data.[3]

One of the strongest matches of deep learning in crime prediction is computer vision and video analysis. This machine learning technique has been used to analyze video footage for surveillance cameras to detect and classify criminal activities, such as murder, assault, robbery, harassment. Various algorithms have also been used to analyze crime data from multiple sources, including crime reports, social media, and police records, providing a more comprehensive view of criminal activities.[4]

The authors (Zhao & Tang, 2018) presented an overview that summarized crime analysis in urban data, discussed theories on criminology and studied several types of criminal tasks algorithms. Author (P. Saravanan et al.,2021), given a survey that explores data mining methods for crime prediction based on different crime factors. Separately, (Kawthalkar et al. 2020), reviewed the various technological mappings solutions for crime prediction in smart cities. The authors considered several different representations of criminal depictions and developed a comparative study. The authors believe that many ideas and procedures have been established for crime prediction, but that field testing is necessary for usability of those approaches. (Shamsuddin et al., 2017), provided a short, simple survey on the execution of methods for crime prediction and the chances of improving them in the future. Another paper (Fredrick David KR et al., 2017), presented a review on the supervised and unsupervised techniques for crime detection in which they analyzed and forecasted crimes.[5]

In this paper, we used the systematic literature review (SLR) technique provided by (Kitchenham & Charters, 2007) to create a survey. It is divided into three phases: planning, conducting, and reporting, each of which comprises multiple stages.[6]

Recent research has examined crime detection and prediction techniques. For instance, the paper [7] studied data mining strategies for predicting criminality based on socioeconomic, spatial-temporal, population, and geographical attributes.

The paper presents an in-depth literature review in which the investigators give their findings on discovering and preparing for spatiotemporal crime clusters. They discussed the difficulties of creating spatiotemporal crime detection and crime prediction model and the role of Artificial intelligence and machine learning in identifying the crimes.[8]

In addition,[9] investigated several technologies tracking solutions for crime detection and crime prediction in intelligent communities. The scientist performed a comparison of a variety of criminal depictions. In accordance with the authors, numerous crime detection and crime prediction methods and concepts have been established, but field testing is necessary to ascertain their viability.

Researchers and developers can conduct studies and create accurate models for detecting and predicting crime hotspots due to the availability of vast crime data accumulated over the past few years. Studying crime trends and patterns has been a top priority for law enforcement agencies to formulate an effective policy for maintaining law and order using historical data. Predicting and detecting crimes based on historical data is a topic that has garnered great interest in numerous research disciplines, leading to the discovery of various aspects of crime detection and crime prediction.

Crime can be considered a location-based characteristic. This is because some locations pose a greater risk of criminal activities than others. Regardless of scale, it is evident that crime is not evenly, uniformly, or even randomly distributed within a given region, area, city.

3. CONCLUSION

This literature review explored crime prediction that has been approached with artificial intelligence and machine learning techniques. It examined scientific papers from several preservatives: research in crime detection and crime prediction with respect to the type and category of crime, time of the study, and the kind of crime most researchers have been discussing. After that, we reviewed the techniques used and their approaches. We examined several factors consisting of the type and category of the crime. The main algorithms that are used to predict crimes in relation to how accurate they are and determine what makes a certain training model suitable with the data provided.

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