

## INVESTIGATION OF CRIME PATTERNS AND DATA MINING APPROACH

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**Abstract:** Because of the country's increasing population and urbanization, crime patterns in India are quickly shifting. Corruption is on the increase in all sectors, but it is especially prevalent in crimes against women, children, and those from lower socioeconomic classes, which is a cause of worry for the Indian government. In India, corruption data is maintained by the National Crime Records Bureau, and a Crime Criminal Information System application is provided for the investigation and reporting of crime data. The police spend numerous hours analysing crime statistics and attempting to manage the many variables that contribute to crime. Tools that can automatically anticipate the variables that have an effective and efficient impact on crime are needed therefore. Crime prevention is one of the most important government objectives when it comes to maintaining broad mass security. Exact crime prediction may help the government and law enforcement agencies in avoiding violence, discovering criminals at an early stage, allocating public resources, and diagnosing crime-related problems by identifying patterns of behavior. As soon as feasible, it is necessary to analyse and understand criminal trends in order to develop any future-oriented tools. There is an investigation of India's state-by-state crime statistics, and there is a comparison with prior studies. This article attempts to review what is known currently about the nature, extent, and effectiveness of community-based efforts to prevent residential crime. Included in this assessment are citizen actions to protect themselves, their property, and their neighbourhood, as well as efforts to prevent crime through changes in the physical environmental and through innovations in community policing.

**Keywords:** Crime Patterns, Corruption, Criminal Information System, Criminal Trends

### I. INTRODUCTION

A felony is an offence that must be prosecuted and enforced by government, typically a fine or in goal. This varies from civil negligence (trespass), which is a claim against a party seeking restitution. Crime crimes are typically punished by the state or the Commonwealth, although persons generally pursue civil litigation. Individuals may bring felony proceedings as well, although it is unusual. In certain instances, it may involve abuse and civil negligence, such as attack. Police may bring a personal injury claim, and the officer can seek legal proceedings to obtain money (or other compensation) for the harm he has sustained. It's impossible to tell whether this was a felony. Those that raise money without authorization would be a criminal crime and others who refuse to refund the funds would be a legal mistake (not a criminal offence). While a legal suit may be taken to reclaim the income, in the case of theft, the creditor may only be sued for criminal offences. If the police attempt to charge the suspects of a total felony is the whole choice they make. Victims of crime cannot compel the authorities to charge the suspect, however private (although uncommon) prosecutions are probable.

Though perversion is an infringement of societal standards, it is not often prosecuted and not always a negative one. In the other side, the offence is a breach of official legislation and can be punishable by legal sanctions. Returning to training is irregular behavior. Running above the state-limit of blood alcohol content is a felony. As all types of delinquency, though, there is uncertainty as to what constitutes a felony, and whether all the offences are necessarily "evil" and punished. Civil rights advocates, for instance, in the 1960s frequently knowingly ignored the legislation as part of their attempts to obtain social equality. With retrospect, we found that laws that criminalized certain activities, such as the Rosa Parks bus ride "white-only" section, were inconsistent with social equity.

In any culture has structured and informal methods to retain social influence. Society has laws and regulations in certain hierarchical structures that establish institutional social order by legislation, and legislation are rules that government institutions follow and enforce. Many that breach such laws will face harmful official penalties. Punishment is generally linked to the degree of the offence and the relevance to society of the loss of the legal foundation. As we will see, though, there are other aspects affecting criminal punishment. [1-3]

### **A. Types of Crime**

There are also common forms of violence. Criminologists typically classify offences into many categories:

- (1) Violent crime
- (2) Violence around land
- (3) Violence at a white collar
- (4) Structured crimes
- (5) Offences performed on a voluntary basis, without damages.

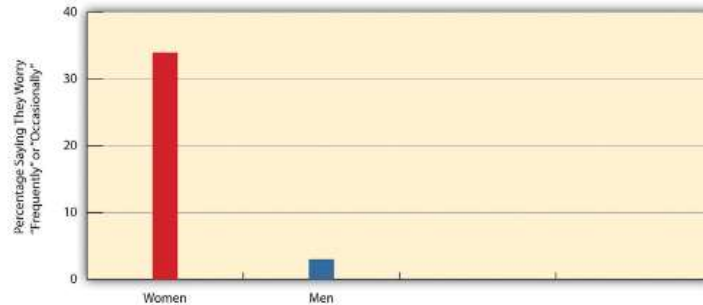
There are also other, unique offences under each group. Serious offences, for example, involve homicide, aggravated and mild attacks, harassment and sexual abuse, and robbery, while burglary, robbery, auto stealing, and arson are property offences. Because a thorough overview of various forms of crime involves a few pages or even a book or more, we highlight here the most relevant facets of the different categories of crime and the concerns they pose for public protection and crime prevention.

Criminal legislation describes criminality that applies to the federal justice framework and the state structure that forbids conduct that is deemed detrimental to society by the government. If an individual participates in such conduct, it may be a criminal act and charged in a criminal court. Crime activities and convictions are commonly portrayed in the mainstream of today's culture, typically articles of famous news programmers and film. As a consequence, persons might presume they are conscious of various forms of crimes. But the rule can be quite confusing.

#### ***a. Violent Crime***

While the media exaggerate the topic of violent crime as our previous article points out, it remains a reality that violent crime plagues many neighborhoods around the world. And it is the sort of crime that most scares Americans. At the outset of this chapter the television report tells us that violent crime is real for many communities. It keeps others at home and makes some reluctant to let their kids play outdoors, or even go to school on foot. Rape and sexual harassment are problems of serious interest to many people, leaving them more fearful of

violence than men: 37 % of respondents indicated they were worried about getting sexually abused in the aforementioned 2011 Gallup survey, whereas just 6% of males were nervous. In that respect, people (see Figure 1. "Gender and fear of sexual harassment" (percentage shows they're "sometimes" or "often" anxious)



**Fig. 1: Collecting data regarding criminal enforcement**

Murder, kidnapping, and sexual harassment are also the focal points in violent crime studies. Murder is of course the most heinous offence because it includes the loss of life. Similarly, data on murder is more reliable than other statistics on crime as most murders draw more interest and are more likely to end in convictions than other crimes. On its portion, the concern on rape and sexual harassment represents the involvement of the recent feminist revolution in these associated offences that started in the 1970s, and the resulting engagement of criminologists (both male and female) in the victims of violence.

There are some elements of the crime deserving of notice. First, while some of the murders were premeditated, most of them were simply reasonably random and were the product of extreme emotions such as rage, hatred or envy. Willingness to kill: senseless assassination. Upper Saddle River: Prentice-Hall, New Jersey. Two parties will start fighting for separate motives and things can keep escalating. Then there will be battles, causing devastating harm, but an attacker may still pick up and fire the weapons.

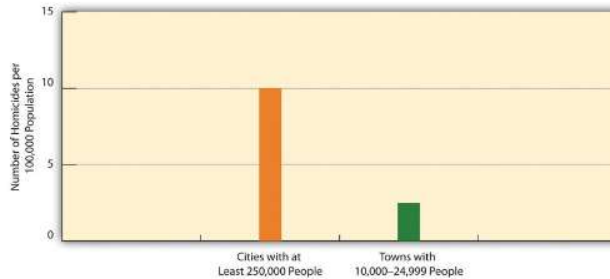
Second, on the first point, the bulk of murder offenders and victims met each other before the shooting. Indeed, nearly three-quarters of the murders included non-strangers, while about one-quarter were linked to outsiders. Roughly 30 percent of all murders involve family spouses (husband, ex-wife, present and previous friends) and other families. Double logarithmic association model, used to classify murders with an uncertain connexion between survivor and suspect. So, while fear of deadly attacks on strangers dominates American consciousness, in fact, people we know are more likely to destroy us than people we don't know.

Third, weapons were used in about two-thirds of the killings. To be precise, weapons are used by more than half of citizens and gun-related killings include pistols, shotguns, or other weapons that are yet to be reported. Then the mixture of these three factors would not include outsiders in the most famous killing, and their claims can eventually intensify, and contribute to the use of deadly force when an enemy uses a weapon.

Fourthly, most murders (often violent crimes) are interracial, indicating that they take place within the same ethnicity. The survivor and the attacker are of the same ethnicity. For single perpetrator / single victim killings where all sides' races are identified, African American criminals killed about 90 percent of African American victims, and white criminals killed about 83 percent of white victims. The American Incident, 2010. Washington, DC: Authors State.

While whites are more worried with hurting African Americans than blacks, in fact whites are more likely than African Americans to be murdered by other whites. While half of all murders were perpetrated by African Americans, most of their victims were African Americans too. Fifthly, males account for nearly 90% of all shootings, while women account for just 10%. As addressed in section, "Race and Racial Inequality: An Introduction to History," males are more prone to commit certain types of crime than women and this is particularly true of both murders and abuse.

Sixthly, in major cities the murder rate is greater than in rural towns. In 2010, in cities with a population of 250,000 or greater, the homicide rate (homicide rate per 100,000 inhabitants) was 10.0 percent, while in cities with a population of 10,000 to 24,999, the homicide rate was just 2.5 percent ("size population and homicide rate, 2010"). Consequently, the chance of getting killed in major cities is four times that of being killed in small towns. Although most residents in major cities are certainly not likely to die of suicide, the location we all reside in also introduces us to the possibility of murder is distinct from other murders. [4-7]



**Fig. 1: The American Incident, 2010. Washington, DC: Journalist**

Source: FBI estimates. (2011)

***b. Property Crime***

The principal property crimes, as stated earlier, are burglary, burglary, car theft and arson. These crimes are very prevalent in the USA and elsewhere. As seen in Table 8.1 "Crime Amount in 2010: Combined Crime Study (UCR) and National Crime Victim Survey (NCVS)" millions of citizens fall into this country per year. Many Americans have mounted anti-theft detectors in their homes and other protective devices, including similar systems in cars and SUVs.

Although property crime is not personal injury, it also matters to us, partially because it impacts so many of us. While property crime has also decreased with violent crime since the early 1990s, it is nevertheless deemed a major component of the crime issue since it is so widespread that it generates annual losses of billions of dollars.

From the position of property offenders and social networks can be understood several property crimes. Many researchers make a line between amateur fraud and professional fraud in this respect. Many property offenders are novice offenders: they are inexperienced and not skilled at violence, and from any single robbery they gain very little profit. They still did not plot their own crimes but performed offences as they saw a chance to get criminal profits fast.

On the opposite, experienced property robbers are mostly older and very advanced in illegal tactics and comparatively high is their revenue from any theft. Not shockingly they also prepare ahead of time offences. Named anti-cat robbery applies to those in tall buildings that rob costly jewels, artwork, or vast sums of money. It may be a common definition of royal trained

offenders. Many skilled criminals are studying how to conduct crimes from other experienced robbers, and in this way they are directed by professional thieves much as teachers lead students and older employee's lead young people.

### *c. White-Collar Crime*

White collar offences are offences perpetrated by higher-ranking persons that conduct offences depending on their occupational history. This covers misappropriation of public funds (stealing of workers' money), stock dealing, tax avoidance and other income tax law breaches.

White collar crime typically causes fewer concern in the eyes of the people compared with other forms of crime. However, white collar corruption has a larger effect on culture as per the actual amount of dollars. For example, the "Great Downturn" can partially be interpreted as attributable to numerous white-collar criminalities in the mortgage industry. However, these offences typically attract the fewest inquiries and convictions since the benefits of color, class and gender shield them.

### *d. Organized Crime*

Organ crime is practiced by hierarchical groups and typically entails the manufacture and selling of illegal goods. Many people think of the mafia when they think of organized crime, however the word may apply to any group that regulates major criminal activity (such as cocaine trafficking, illegal gambling, prostitution, weapons smuggling, or money laundering). A significant social phenomenon in study or organized crime is the organization of these sectors in the same manner as traditional structures and the implementation of a corporate structure. Typically, there are big shareholders who monitor income, workers who run and operate for the business and clients who purchase the organization's products and services.

### *e. Personal Crimes*

Individual crimes are crimes which cause other people physical or psychological damage. It can be broken into two groups, assassination and other types of violent crime. If the physical injury of another citizen is too severe of trigger death, so the perpetrator can be charged with any of the above crimes, including homicide at first degree, premeditated murder or auto murder. Crimes against aggression are risky too, including: [8-9]

- assault and battery
- arson
- child abuse
- domestic abuse
- kidnapping
- rape and statutory rape

## II. REVIEW OF LITERATURE

**Hussein et al. (2020)**, In this paper, we introduce two types of hybridization. The first contribution is the hybridization between the Viterbi algorithm and Baum Welch in order to predict crime locations. While the second contribution considers the optimization based on decision tree (DT) in combination with the Viterbi algorithm for criminal identification using Iraq and India crime dataset. This work is based on our previous work. The main goal is to enhance the results of the model in both consuming times and to get a more accurate model. The obtained results proved the achievement of both goals in an efficient way. **Jain et al.**

(2020), The crime on roads is a major problem faced today by all the modern cities. Road Transport is the most common escape route for many criminals. Thefts and many other crimes remain unregistered and unsolved due to lack of evidence. Effective tracking of vehicles and criminals is still a big problem and involves plenty of resources. To evade such a condition, we have proposed a machine learning-based practical crime detection system using the text and face recognition techniques. Such systems will be proved useful in parking lots, toll stations, airports, border crossings, etc. In the proposed system, the text recognition involves extracting the characters present in the Indian number plates and the predicted output will be compared with the registered vehicle database. Simultaneously, Face recognition feature constitutes identifying criminal faces based on certain face regions and then mapping the respected coordinates with the criminal database. The proposed system presented in this research paper targets to deliver improvised outcomes considering the time constraints and accuracy with more than 85% successful recognitions in normal working conditions with the goal to accomplish the successful detection of crime using machine learning algorithms such as KNN, SVM, and face detection classifiers to present a practical real time detection. **Singh et al. (2019)**, As a supplement to mug-shot detection, a new approach is proposed to capture the eyewitness's visual perception in the form of symbolic representation. It reveals physiological and facial characteristics of criminal which help in their identification. A rough set theory-based technique is introduced to model those symbolic representations. This approach provides an intuitive insight to process criminal's imprecise and imperfect knowledge. We used a benchmark mug-shot dataset consisting of 300 criminals faces from the Chinese University of Hong Kong (CUHK) to study the correctness of our proposed model. We took the help of 105 students of Indian Institute of Information Technology, Allahabad, who were treated as eyewitness to depict the visual perception about 300 criminal faces of CUHK. The experimental verification is composed of two modes which are analogous to viewed sketches and forensic sketches. Like viewed sketches we have generated test case-I, where perception is given while looking at the photo whereas test case-II is like the forensic sketches where the description is given by recalling the memory. We have achieved encouraging results on the viewed sketch database as well as forensic sketch database. **Mittal et al. (2019)**, Trends of crimes in India keep changing with the growing population and rapid development of towns and cities. The rise in crimes at any place especially crimes against women, children and weaker sections of the society is a worrying factor for the Indian Government. In India, the crime data is maintained by National Crime Records Bureau as well as an application called Crime Criminal Information System is available to make inquiry and generate reports for the crime data. To curb crime, the Police need countless hours to go through the crime data and determine the various factors that affect it. Therefore, there is necessity of tools which can automatically predict the factors that effects the crimes effectively and efficiently. The field of machine learning has emerged in the recent years for this purpose. In this paper, various machine learning techniques have been applied on crime data to monitor the impact of economic crisis on the crime in India. The effect of unemployment rates and Gross District Domestic Product on theft, robbery and burglary has been monitored across districts of various states in India. Further, Granger causality between crime rates and economic indicators has also been calculated. It has been observed from the experimental work that unemployment rate is the major economic factor which affects the crime rate, thus paving the

path to control the crime rate by raising more opportunities for the employment. **Pavithra & Suresh (2019)**, Fingerprint images in crime scene are important clues to solve serial cases. In this paper we present a complete crime scene fingerprint identification system using deep machine learning with Convolutional Neural Network (CNN). Images are acquired from crime scene using methods ranging from precision photography to complex physical and chemical processing techniques and saved as the database. The images collected from the crime scene are usually incomplete and hence difficult to categorize. Suitable enhancement methods are required for pre-processing the fingerprint images. Minutiae are extracted from the fingerprint images. The features of pre-processed data are fed into the CNN as input to train and test the network. The experimental results demonstrated on database using Open CV-Python shows high accuracy of 80% recognition a partial or full fingerprints in the criminal database. **Hussein et al. (2019)**, Data-mining methods, which can be optimized via different methods, are applied in crime detection. This work, the decision tree algorithm is used for classifying and optimizing its structure with the smart method. This method is applied to two datasets: Iraq and India criminals. The goal of the proposed method is to identify criminals using a mining method based on smart search. This contribution helps in acquisition of better results than those provided by traditional mining methods via controlling the size of the tree through decreasing leaf size. **Prabakaran & Mitra (2018)**, Data mining is the field containing procedures for finding designs or patterns in a huge dataset, it includes strategies at the convergence of machine learning and database framework. It can be applied to various fields like future healthcare, market basket analysis, education, manufacturing engineering, crime investigation etc. Among these, crime investigation is an interesting application to process crime characteristics to help the society for a better living. This paper survey various data mining techniques used in this domain. This study may be helpful in designing new strategies for crime prediction and analysis. **Qayyum & Dar (2018)**, In large datasets, data mining is one of the most powerful ways of knowledge extraction or we can say it is one of the best approaches to detect underlying relationships among data with the help of machine learning and artificial intelligence techniques. Crime Detection is one of the hot topics in data mining where different patterns of criminology are identified. It includes variety of steps, starting from identification of crime characterization till detection of crime pattern. For this purpose, various crime detection techniques have been discussed in literature. In this paper, we have selected widely adapted data mining techniques that are specifically used for crime detection. The analytical study is presented with an extraction in form of strengths and weakness of each technique. Each technique is specific to its use, for example to identify the social ties and roles of criminal in any network, Social Network Analysis techniques is best suited because of its degree, density and centrality of nodes. This survey would serve as a helping guide to researchers to get state of the art crime detection techniques in data mining along with pros and cons. **S Prabakaran et al. (2018)**, Studied on survey and analysis of crime detection technology based on data mining and machine learning. Data mining is a process for finding large data set designs and patterns, including strategies for fusing machine learning and database framework that can be applied to fields such as future medical care, market basket analysis, education, manufacturing engineering and criminal investigation. Among them, criminal investigation is an interesting application that helps deal with the features of crime and help society live a better life. This article describes the various data mining techniques used in this area. This research may help

to design new crime prediction and analysis strategies. **Abiodun Esther Omolara et al. (2018)**, studied on State-of-The-Art in Big Data Application technology is to prevent and detect financial crime in big data technology applications for over 20 years. In addition, the industry sector that determines the most concerned with financial crimes and in which areas research is still lacking. This survey describes the most common ways to detect financial crimes and points out some of the current survey issues, trends, and issues with big data applications. At the same time, the survey focused on financial crime detection methods in banks, computer networks, insurance, securities, foreign exchange products, the stock market, and money laundering. The methods considered in the survey are big data analysis basic technology and Big Data Analysis Emerging Research. The transition from traditional data collection methods to computer-based methods for most data collection strategies and data analysis. In the area of data analysis, the use of statistical analysis of descriptive reasoning is increasing. We evaluated the detection method based on data analysis factors such as processing speed, latency, volume, performance, fault tolerance, scalability, and accuracy. Second, we propose anomalies, data mining, clustering, hybrid techniques, neural networks, rough clustering, k-means clustering, Neuro-fuzzy, genetic algorithms and fuzzy support vector machine models to outperform other practical methods Demonstrate. However, big data infrastructures, such as hardware devices, software licenses, and maintenance, are still very expensive and require more research. Similarly, the task of selecting information requires further analysis of human data, from the big data approach to financial crime detection. **Radha Mothukuri et al. (2018)**, introduced cluster analysis of cybercrime data. This article describes very basic algorithms such as **K-means, Fuzzy C Mean, Hierarchical Clustering**, and uses R data mining tools. The results were tested with data sets, i.e. popularity of online news, data analysis of cyber-crime data sets. Using different clustering algorithms to analyse all data sets, the data we present are how they work with R data mining tools. Each algorithm has its own uniqueness and antithetical behavior. The characteristics of the crime are constantly changing over time. Changes and increases in crime cause problems in the understanding of criminal behavior, crime prediction, and the accurate detection and management of large amounts of data obtained from various sources. Researchers are trying to solve these problems. In the criminal investigation process, input data is very important for use in training and testing processes. The training process is used to complete the crime model and the testing process is used to validate the algorithm. Crime model issues include hidden crime detection and prediction. The proposed methodology provides security for crime data during outsourcing. Organize and classify crime information. When classifying crime data, add watermark content for defence. Watermark content is used to validate categorical data. Based on clustering and classification, data can be classified and kept safe. In addition, crime data is classified by crime rate. **Ms. Vrushali Pednekar et al. (2018)**, Studied on Crime Rate Prediction using KNN. Crime is one of the most important and shocking aspects of our society, and prevention is an important task. Crime analysis is a systematic approach to investigating and investigating criminal patterns and trends. Therefore, it is necessary to examine the different causes, factors, and relationships between the different crimes that have occurred and find the most appropriate way to manage and avoid more crimes. The main purpose of this project is to classify cluster crimes based on the frequency of occurrence each year. Data mining is widely used to analyse, investigate, and discover different crime patterns. In this study, various data mining clustering methods are used to analyse crime



data. K-nearest neighbor (KNN) classification is used for crime prediction. The proposed system can predict areas likely to be criminalized and can predict areas prone to crime. Political hate etc. concentrates mainly on criminal factors rather than the criminal background of the crime such as the cause of the crime.

### III. CRIME DETECTION USING DATA MINING TECHNIQUE

A crime is any act or omission that violates a law which results in a punishment. Punishments can range from the payment of a fine to incarceration in jail. The level of the offense or crime will usually be set in proportion to the severity of the crime. For example, parking in a two-hour parking zone for three hours is a crime. The punishment usually involves the issuance of a ticket and an individual paying a fine. On the other end, robbing someone at gun point is a much more severe crime that can result in a lengthy prison sentence. If a statute merely encourages a conduct, but does not provide a punishment, then a violation is not generally considered a crime, even though you may be exposed to some type of civil liability. For example, many family codes have general policy statements that encourage parents to resolve custody disputes in a friendly manner. If the custody battle turns ugly, a violation of the general policy rule, by itself, is not a crime because there is not a defined punishment. Which specific acts or omissions constitute "crimes" depends on the governmental bodies where you live. Most likely you will be subject to three sets of laws at any given time. The first set is defined by federal statute. The second set is outlined by your state government. The third set are laws are enacted by local government and are commonly referred to as municipal ordinances. Local rules focus on the conduct that the local community expects people to abide by like speed limits in school zones and noise control at certain hours. If there is ever a conflict in federal law with a state or local rule, federal law will generally control. This has been a heated discussion in California where medical marijuana is authorized by state statutes. However, federal prosecutors continue to prosecute cases involving medical marijuana because possession of marijuana is still illegal pursuant to federal statutes, without exception. Most crimes require that you complete an affirmative act before you can be punished for the conduct. If you store drugs in the pocket of your jacket, you are affirmatively possessing a controlled substance. Some crimes, ironically, punish for omissions. For example, if you are aware that your boyfriend is physically abusing your child, you could be charged for failing to report child abuse. The basis of the crime isn't what you did, but rather what you failed to do. Crime is an essentially contested concept. There is no universally agreed definition of what a crime is. However, the most straightforward way of thinking about crime is to look at it in terms of a legalistic perspective - from this approach a crime is an act which is illegal. It's against the law. Specifically, it is against the criminal law. In so doing the act will have certain aspects to it - it will have an aspect of criminal harm and it will have an aspect of criminal blame. Interestingly though, many people have questioned this legalistic definition. First of all, this is because it's always going to be partial and determined within a very specific and limited set of criteria about what is crime. If a given act isn't illegal, then whilst we might see it as wrong, or problematic or harmful, it's not going to be something which will be defined as a crime. Many criminologists have argued that it is important to unpack the legal definition, and have questioned the very notions of what is and what criminal harm isn't. Criminologists have also questioned notions around criminal blame and both the strengths and weaknesses of a backward-looking approach grounded in individual culpability. A number of criminologists

have even gone as far to say that a crime is a statist category, i.e. that it's defined by the state and it's infused with certain interests, ideas and power relations which reflect the interests of the powerful. For these critics, the state defined categories of crime reflect the interests of those who have something to lose in society, whereas at the same time it does not necessarily reflect the interests of those who are powerless or those at the bottom end of society. Hence, the crime logic is seen as imposed and perhaps even a reconstruction of reality in legalistic and statist classifications. A crime something which is placed as a specific legal category, as a way of generating meanings and understandings and some criminologists (sometimes referred to as abolitionists) have argued that this is a problem in itself and that we shouldn't necessarily even think about the logic of crime because using the language and logic of crime will lead those who are responding to it down certain pathways which may be considered solutions, such as punishment. [10-12]

#### IV. CONCLUSION AND FUTURE WORK

Crime continues to remain a severe threat to all communities and nations across the globe alongside the sophistication in technology and processes which are being exploited to enable highly complex criminal activities. Data Mining, the process of uncovering hidden information from Big Data is now an important tool for investigating, curbing and preventing crime, and is exploited by both private and Government institutions around the world. The primary aim of this paper is to provide a concise review of the Data Mining applications in crime. To this end the paper reviews over many applications of Data Mining in Crime covering a substantial quantity of research to date, presented in chronological order with an overview table of many important Data Mining applications in the crime domain as a reference directory. his paper produced comprehensive research in which different reviews of previous literatures are presented.

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