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Key Elements of Predictive Policing Include Crime Analysis, Crime Mapping and Geographies

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Abstract:- The goal of this article is to provide a reference manual for those who are interested in writing on predictive policing, which will include evaluations of the most promising technical tools for producing predictions as well as the most promising tactical strategies to act on such predictions. More generally, this research aims to place predictive policing in relation to other contemporary, proactive policing measures: Although predictive policing is merely a tool, it can be a very helpful one. It is not a magic oracle. The second section will go through how predictive policing is conceptualized, as well as its potential and actual advantages and disadvantages. Review clarifies how predictive policing is conceptualized, as well as its potential, actual benefits, and disadvantages.

Predictive policing, also known as crime forecasting, is a set of high technologies aiding the police in solving past crimes and pre-emptively fighting and preventing future ones. With the right deployment of such technologies, law enforcement agencies can combat and control crime more efficiently with time and resources better employed and allocated. The current practices of predictive policing include the integration of various technologies, ranging from predictive crime maps and surveillance cameras to sophisticated computer software and artificial intelligence. Predictive analytics help the police make predictions about where and when future crime is most likely to happen and who will be the perpetrator and who the potential victim. The underpinning logic behind such predictions is the predictability of criminal behaviour and crime patterns based on criminological research and theories such as rational choice and deterrence theories, routine activities theory, and broken windows theory.

Keywords:- *Predictive policing,Forecasting, Crime mapping, Prediction, Pre-processing data,Algorithms,Policing technology, Social control, Machine learning.*

I. INTRODUCTION

Police work is at a crossroads. There are more and more cries for more equitable law enforcement. Predictive policing systems have received a lot of attention as law enforcement officials adopt contemporary technology to anticipate criminal conduct. Predictive policing has been used in the majority of developed countries, while opinions on its efficacy are divided. Predictive policing began with basic heuristics and algorithms, but as the technology landscape has evolved, it has become more sophisticated. Results must be visible in order for these novel tactics to succeed, develop over time, and be applied by police officers at various levels (Perry et al., 2019: 3). The goal of PP is to "issue crime forecasts in the same way the Weather Service issues storm alerts," according to Zavrsnik (2017: 1), and so to disrupt the "production cycle" of crime. With automated justice, it will be possible to eliminate prejudices and heuristics and limit essentially moral decisions to 'clean and pure' mathematical reasoning (Zavrsnik, 2017: 1).

The rise of predictive policing, which claims to be the holy grail of policing by stopping crime before it occurs, is sweeping the country. According to Walter, Perry, McInnis, Carter, Price, Susan, Smith, John, and Hollywood (2013), predictive policing is the application of analytical techniques, particularly quantitative techniques, to identify likely targets for police intervention and prevent crime or solve past crimes by making statistical predictions. It has been common practice for many years to predict crime rates using statistical and geospatial analysis.The algorithm makes a forecast about the increased likelihood of a specific crime at a specific location during a specific time period using big data.

The two main tenets of place-based predictive policing are that (1) mathematical forecasting techniques can be used to predict future crime risk in precisely defined geographic areas, and (2) the deployment of police resources to those prediction locations reduces the likelihood of crime occurring (Bowers, Johnson, and Pease, 2004; Mohler et al., 2011). Predictive policing can be defined as the application of data analysis technologies by the police to generate and effectuate actionable forecasts of sources and spatiotemporal conditions of future crime. This definition implies that predictive policing is a cross-cutting policing strategy, a multidimensional process encompassing not only the generation of crime predictions by algorithmic-mediated data analysis but also the gathering and preparation of input data and the “journey” of the prediction from the police department to its implementation on the street (Perry et al. 2013: 11-15; Bennett Moses and Chan 2018: 807).

In reality, the bulk of hotspot and place-based predictive policing algorithms concentrate less on arrests and more on crimes like robberies, burglaries, andassaults that are frequently reported to the police by members of the public (Mohler et al. 2015 and Ferguson, 2017). The objective is to dispatch police to locations where crimes have been reported by victims in order to stop further crimes from occurring there. The predictive narrative shifts the police's attention away from what already occurred and toward what might occur, as well as toward the effective and efficient use of available resources to combat crime (Beck and McCue, 2009). Although the ideal situation for any rational police agency is to prevent criminal activity,

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predictive policing also plays a crucial role in responding to criminal situations.

For instance, it might help the law enforcement agency catch the offender in the act (Martens 2017). Although it has been suggested that predictive policing has been around for a while (Ferguson, 2020, Ferguson 2017, Bachner, 2013, Perry et al. 2013), it's possible that the importance of cutting-edge technology in enhancing predictive policing is a more recent development. Prior to the shift toward using technology to anticipate crime, the police could only make these predictions about crime based on their own expertise and experience.However, in industrialized nations like the United States of America, Geographic Information Systems (GIS) and Computerized Statistics (CompStat) were utilized to anticipate and address crime in the 1990s (Ferguson, et al. 2017). The goal of predictive policing is proactive, as opposed to the old usage of GIS and CompStat, which was mostly reactive (Bachner, 2013). This means that crime should be avoided from happening in the first place. This research, however, concentrates on modern advanced technology applications to anticipate crime, notwithstanding the enormous contribution of these data-driven technologies from the 1990s to deal with crime.

The transition to data-driven police operations, which has been accepted recently and is expanding quickly, includes predictive policing (Brayne, 2017). Although there isn't a single definition for predictive policing, the fundamental traits can be summed up as follows. Predictive policing is a police tactic in which a wide range of data about crimes is typically analyzed and visualized with the aid of software. A definition that reflects the core of technology in crime prediction is required because the main idea of this paper—and maybe the future of predictive policing—is based on cutting-edge technology. Perry et al.'s (2013) definition may be more precise and has been taken up by a number of authors.Meijer and Wessels provide a more recent definition, stating that "predictive policing is the collection and analysis of data about prior crimes for identification and statistical prediction of individuals or geospatial areas in with an increased probability of criminal activity to help develop policing intervention and prevention strategies and tactics" (2019: 1033). The concept is arguably a little convoluted, despite the fact that it seems to contain the essential elements of predictive policing. The essential role that technology plays in crime prediction seems to be captured by contemporary definitions.

Three key aspects can be derived from the above definitions, and these are the importance of historic crime data, the essence of computer-based applications, and the anticipation of future crime. Another important observation relates to the use of vast data from disparate sources, and we want to emphasise, as shall be seen in this paper, that some of the data may not necessarily be relating to crime but other sociodemographic aspects. We give the following condensed description of predictive policing after reviewing definitions from renowned academics and trying to discover definitional convergence: "Predictive policing is a policing model that uses historical crime and socio-demographic data from dispersed sources to predict future crimes using cutting-edge computer applications," according to Wikipedia. Crime prediction's main objective is to help the police reduce crime, both strategically and tactically. Therefore, crime prediction in and of itself is insufficient unless the results are applied to the decision-making process, particularly when it comes to the deployment of personnel and resources.

Predictive policing is described as "the application of analytical techniques- particularly quantifiable techniques- to identify likely targets for police intervention and prevent crime or solve past crimes by making statistical predictions" (Perry et al. 2013). The essence of predictive policing is best summed up by Uchida, who is cited by Meijer and Wessels (2019), who writes: "Predictive policing is a concept that is built on the premise that it is possible to predict when and where crimes will occur again in the future by using sophisticated computer analysis of information about previously committed crimes" (2019: 1033).This information is utilized to anticipate potential future crimes based on people, space-time, or both. In order to counter the risks identified with appropriate police actions and to prevent, decrease, dissuade, or at the very least capture criminals on the scene, it is necessary to forecast a future crime as accurately as possible in time and location (Gluba & Pett, 2016: 2). Although the current emphasis is on allocating police resources in response to threats that have been identified, the ideal solution would be created to address the unique causes and circumstances of an issue and to encourage multi-agency action. Of course, it would be necessary to consider the interests of particular groups as well as the effects on local communities and society at large when using data for multi-agency action.

According to Chief Inspector of Constabulary Tom Windsor (as reported in Travis, 2013), the police have a responsibility to stop crime from occuring and keep the citizens of their community secure. Windsor argues that the lack of crime and disruption should be the key test for the police, not the obvious actions the police engage in in dealing with it, in line with Sir Robert Peel, who established modern policing in 1829 (Emsley, 2011).So, while it may be a means to a goal, arresting criminals is not an end in and of itself. Since the public need not suffer injury first for the police to take action, this reinforces the idea of the social contract and increases police credibility. According to the National Crime Prevention Council (1997), proactive policing is more closely associated with crime prevention than reactive policing. Predictive policing, which is proactive and has gained popularity recently, may be the next development in policing strategy and the ultimate form of crime prevention.

Traditional policing is not supplanted by predictive policing. Instead, by processing pre-existing data more effectively and reliably, it offers the LEA and related stakeholders (such as local governments, housing businesses, etc.) an extra tool. Ferguson (2017) asserts that there are three primary orientations for software-based analytic approaches to predictive policing: (1) targeting locations of property crime; (2) targeting locations of violent crime; and (3) targeting individuals engaged in criminal

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activity.The first is the most popular Predictive Policing strategy, concentrating on carjacking, auto theft, and theft from vehicles. They are currently regarded as the most predictable crimes due to their frequency and the fact that the majority of these crimes are reported to the police. Predictive policing may also be influenced by pertinent criminological ideas, such as van Eck's Crime Triangle (van Dijk et al., 2015: 12). Furthermore, findings from social science research indicate that these crimes are motivated by environmental vulnerabilities that can be found and addressed with police actions, such as police presence in the targeted neighborhoods (Ferguson, 2017: 1126–1127).

Additionally, predictive policing developed into a method for foretelling violent crimes in cities. Through traditional hot spot policing, it is recognized that violent crimes (including robberies, aggravated assaults, and shootings) frequently take place in particular places, such as nightlife areas where drugs and alcohol are used. Additionally, locations that have been claimed by criminal organizations can reveal where gun violence is most likely to occur. Traditional hot spot policing characteristics were modified and augmented with new data in order to forecast violent crimes and establish a wider strategy (ibid., p. 1132-1133).The perpetrators and victims came more and more into focus in order to make even more accurate and detailed predictions and to stop crime at its source. The method was modified for use in the field of predictive policing after being initially used to identify possible terrorist networks. The fundamental idea behind forecasting criminals or victims entails a thorough examination of a person's social networks, previous criminal activity, or ties to known offenders using information from addresses, social media, phone numbers, etc. A small percentage of the population has a higher probability of becoming a victim of crime or experiencing victimization repeatedly, according to victimization research findings.

Consequently, police tactics concentrate on a proactive approach that directly addresses those who are most likely to commit crimes or become victims (Ferguson, 2017: 1138). The police's risk assessment of people and locations is supported by this strategy. In order to incorporate them in the study, it looks for prospective aspects that may not have been taken into account in conventional police work (Ferguson, 2017: 1125). According to Perry et al. (2013), effective measures to a particular risk need to be established in order to have an influence on crime in the long run.A small percentage of the population represented a large percentage of the victims of crime, according to research from the 1970s on the rates of re-victimization of people and places (Sparks et al., 1977; Hindelang et al., 1978). The same was true for specific locations. For a variety of crimes, including burglary, domestic violence, bank robbery, and theft from motor vehicles, previous research have demonstrated the repeat victimization phenomena (Lamm-Weisel, 2001; Braga & Weisburd, 2010; Johnson & Bowers, 2004).

II. SHORT HISTORY OF PREDICTIVE POLING

Although techniques for anticipating crime have been around for a while, it has only been recently that contemporary technology has allowed these efforts to advance from straightforward heuristic techniques to complex mathematical algorithms. The LAPD and former police Chief William J. Bratton are credited with developing the predictive policing concept. By 2008, Chief Bratton had made numerous public appearances to discuss the LAPD's accomplishments, including the department's recent adoption of predictive analytics to foresee gang violence and assist real-time crime monitoring. According to Chief Bratton (2015), this new strategy might build upon and improve upon current strategies like community-oriented policing and intelligence-led policing.In 2008, Chief Bratton collaborated closely with the acting directors of the National Institute of Justice (NIJ), Kristina Rose and James H. Burch II of the Bureau of Justice Assistance to examine the emerging idea of predictive policing and its implications for law enforcement organizations. For this endeavor, the NIJ organized two consecutive predictive policing symposiums where leading researchers, practitioners, policymakers, and law enforcement officials gathered (Chief William Bratton, 2015).

Chief Bratton "served as the catalyst for bringing predictive policing to the forefront," according to Kristina Rose in her opening remarks at the first symposium, which was held in Los Angeles in November 2009. She also noted the interest in the sector as a whole in comprehending the phrase "predictive policing" and the policy, technical, and operational ramifications of such approaches. She listed a number of law enforcement organizations from across the country, including the Baltimore State Police, Boston, Chicago, Los Angeles, D.C. Metropolitan, New York, and Shreveport police departments, who had responded to a request for proposals from organizations interested in taking part in a predictive policing demonstration initiative.At all levels of law enforcement, there was extensive discussion about the Los Angeles symposium, and the subject of predictive policing attracted a lot of attention on both traditional and social media. Quickly, consultants and private businesses started offering expert services and software that they believed would be valuable and appropriate for efforts at predictive policing.

A second symposium was conducted in Providence, Rhode Island, in June 2010 with significant momentum. Extended talks from the first symposium were presented during the occasion, and it was generally agreed that more research into predictive policing was necessary. Major points of emphasis included difficulties, achievements, restrictions, and scalability. Participants stressed how important it is to regionalize and share data as well as the need of having excellent analytical skills (National Institute of Justice, 2012).Predictive policing, however, has a much longer history. US police departments started experimenting with technical techniques for systematic data analysis in the early 2000s. For instance, in order to analyze threats and deploy tactical units based on risk, the Richmond Police Department started using SPSS data mining programs in

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2003 (McCue and Parker, 2003; McCue, 2007). Later, comparable methods were adopted by other departments (Robinson and Koepke, 2016).

The term "predictive policing" was first used explicitly in 2008 (Perry et al., 2013: 4), and this framing was steadfastly supported by the media attention that accompanied the implementation of the software tool PredPol by the police departments of Santa Cruz and Los Angeles in 2011. PredPol is short for Predictive Policing. The Los Angeles Police Department and University of California researchers worked together to develop PredPol, which was the result of their efforts to combine criminological theory and police data in order to create a practical analytical tool for police work (Mohler et al., 2015).

The US National Institute of Justice (NIJ) and the Bureau of Justice Assistance (BJA), which organized two seminal symposia on predictive policing in order to further explore its potential, its organizational requirements, and its potential effects on policing routines and practices, also played a significant role in the advancement of algorithmic crime analysis methods (Pearsall, 2010). In order to ensure they received plenty of attention from the law enforcement community, they consulted with William Bratton, a well-known figure in the American police scene and the former commissioner of the police departments of Boston, New York, as well as former police chief of Los Angeles (Bureau of Justice Assistance, 2009; Perry et al., 2013: 4). Additionally, to support basic and applied research on predictive policing, the NIJ provided funds to academics and police forces. When taken as a whole, these initiatives provide a significant boost for the creation of crime prediction software and its use in the US (Ferguson, 2017: 32).

III. THEORETICAL FRAMEWORK

The assumption that crime is predictable (in a statistical sense) is well supported by a large body of data, mostly because criminals like to operate in their comfort zones. In other words, they frequently carry out the same or similar crimes that they have successfully accomplished in the past. Although not always the case, this happens frequently enough for these approaches to function fairly well. Jeff Brantingham, an anthropologist at the University of California, Los Angeles who assists in managing the predictive policing project for the Los Angeles Police Department (LAPD),

> The critics want you to assume that people are too complicated and unpredictable, and that this kind of math is impossible. However, people are not nearly as unpredictable as we imagine. Crime is essentially just a physical process, and if you can describe how criminals behave and interact with their victims, you can learn a tremendous amount.

Major theories of criminal behavior, including routine activity theory, rational choice theory, and crime pattern theory, are in agreement with Brantingham's statements (Clarke, and Newman, 2006). We combined these hypotheses for this investigation into what we call a "blended theory":

- Both criminals and victims have similar life patterns, and overlaps in these patterns suggest a higher risk of crime.
- The where and when of certain patterns are influenced by geographical and temporal characteristics.
- As they follow these patterns, criminals choose whether to conduct crimes based on "rational" considerations that include the environment, the suitability of the target, and the likelihood of being apprehended.

Theoretically, we can uncover many of these trends and characteristics using analytics, and we can then use tactical interventions to influence criminals' actions in order to avoid crimes. Robberies, break-ins, and thefts are examples of "stranger offenses," which the mixed theory best matches. Vice and relational violence, which both include human ties that go beyond defined geographic limits and result in decisions that do not fit into conventional "criminal rational choice" frameworks, are less appropriate to this theory. Alternative explanations for vice and domestic violence have, however, been put to the test. As a result, tools and techniques for determining the dangers in these areas have also been developed.

IV. PREDICTIVE POLICING AND OBJECTIVES

Results must be evident if we want to ensure that these novel tactics are adopted, develop through time, and are used by police officers at various levels (Perry et al., 2019: 3). According to Zavrnik (2017: 1), the goal of predictive policing (PP) is to "issue crime forecasts in the same way that the Weather Service issues storm alerts" and so to disrupt the "production cycle" of crime. Automated justice offers the possibility of eliminating prejudices and heuristics while limiting essentially moral judgements to "clean and pure" mathematical reasoning (Zavrnik, 2017: 1). Predictive policing has the broadest breadth identified in the literature, according to Pearsall (2010: 16).

In essence, predictive policing involves gathering data from many sources, analyzing it, and applying the results to predict, stop, and handle crimes more skillfully in the future. Utilizing algorithms to analyze vast amounts of data in order to predict and stop likely future crimes is known as predictive policing. Predictive policing seeks to reduce crime frequency and deploy police personnel with consideration for available resources (Landeskriminalamt, 2018: 10, Egbert 2017, 2018; Gluba 2016; Belina, 2016). Despite the fact that Germany's overall crime rate is dropping, this motive predominates in the federal states (Knobloch, 2018: 10). Different prediction kinds are recognized in practice. On a superordinate level, predictions between space and time or individuals can be distinguished and integrated in use (Egbert &Krasmann 2019: 12).

Using well-established criminological theories as a foundation, predictive policing is a policing tactic that may be incorporated into a larger pre-emptive policing approach (Ferguson, 2017; van Brakel, 2020; Egbert and Leese, 2021). This tactic is based on the rationale that by examining known criminal behavior from the past, we may

ISSN No:-2456-2165

statistically forecast criminal behavior in the near future. This information can then be used to guide resource allocation and police methods (Brayne, Rosenblat, and Boyd, 2015). While this logic is at the heart of predictive policing, not all predictive approaches are the same; as such, this chapter will first explore three distinct types of predictive policing systems – hotspot policing, predictive identification of individuals and predictive identification of objects – before engaging with its critiques and exploring the relationship between society and the concept of risk as a mechanism of governance.

In order to identify the areas where crime is most likely to occur in the near future, hotspot policing looks for trends in the distribution of crime (Kaufmann, Egbert, and Leese, 2018). This type focuses mostly on foretelling high impact crimes like robberies, break-ins, and theft, and it can help determine how heavily police patrol certain regions. The general consensus is that the presence of police in a given area reduces opportunities for crime even in the absence of direct contact with potential offenders (Sherman and Weisburd, 1995; Weisburd, 2008; Loughran et al. 2011), according to experiments in hot spot policing (Braga and Bond, 2008).This overall deterrent impact reportedly spreads into surrounding regions where the police were not concentrating their efforts (Clarke and Weisburd, 1994) and lasts for some time after the police have left (Koper, 1995; Sherman and Weisburd, 1995). However, police patrols can also deter crime in other ways outside general deterrence. By physically immobilizing potential offenders, direct interference through stops, searches, detentions without arrest, and arrests may deter crime (Weisburd and Eck, 2004).

If prolific offenders are being arrested, this use of selective incapacitation may have an immediate impact on crime (Wyant et al. 2012). If those repeat offenders are later expelled from the community, incapacitation might have longer-term consequences. There is a lot of evidence to support the idea that bias, both verbal and unconscious, can significantly affect who is stopped, searched, and arrested.Predictive policing raises legitimate concerns that it might increase these prejudices and strengthen any propensity for police to target minorities and their neighborhoods (Ferguson Citation in press). Such worries arise even if the forecasting techniques used to power predictive policing do not include information that would explicitly be biased. Any crime reduction advantages would need to be considered in terms of their discriminatory costs if predictive policing unintentionally worsens bias. In the worst-case scenario, proven benefits might only result from prejudice brought on by projections.

In other words, projections without this bias wouldn't result in any reductions in crime. In reality, most hotspot and place-based predictive policing algorithms (Mohler et al. 2015; Ferguson, 2015) concentrate less emphasis on arrests and more emphasis on crimes like robberies, burglaries, and assaults that are frequently reported to the police by members of the public. The objective is to dispatch police to locations where crimes have been reported by victims in order to stop further crimes from occurring there. The Crime Anticipation System in the Netherlands (Willems 2014; Drenth 2017), (Knobloch 2018; Seidensticker, Bode and Stoffel 2018; Egbert and Leese 2021) have all been tested by European police agencies.

The primary difference between these various tools is in their ownership structures: some models were created internally by police, while others were created in collaboration with universities, and yet others were purchased off the shelf from for-profit vendors. The way the models are built is a further point of distinction. While most studies calculate the spatio-temporal distribution of crime primarily using police data (the type, location, date, and time of the crime), others also take into account factors like weather, holidays, events, and distance from highways (Ferguson, 2017; Hardyns and Rummens, 2018), arguing that certain seasonal factors and proximity to highways have historically contributed to an increase in criminal activity in certain areas.Given that police departments typically use location-based data, Hot-Spot methods are the most widely used forecasting technology in the field of criminal activities. According to Groff & La Vigne (2002: 34), "crime analysts prepare maps of crimes that have already occurred and those maps are used to deploy officers and to identify areas in need of intervention" in this situation. Approaches for predicting criminals, the identities of criminals, and possible victims of crime are more based on person-related datasets.

If deployed and taught properly, the usage of intelligent prediction tools can offer a number of advantages. To help investigators identify, foresee, and resolve criminal investigations, the analytical function creates a variety of intelligent products. Thus, prosecution is based on information that has been gathered and presented in carefully designed tables, charts, maps, or other graphics.Aiming to support both the decision-making of top executives or the agency's goal (Ioimo, 2018: 6). Supporting the adjudication of trials. Tactical and strategic suggestions can help law enforcement officers. These reports can include crime hotspots, crime bulletins, and crime summaries, as well as crime trends, potential threats, vulnerability, and risk assessment analyses (Iomio, et al. 2007: 7).

By facilitating quick access to information and assisting in multijurisdictional cases, computerized databases serve as a foundation for PP, organize information, and establish meaningful ties with other law enforcement staffs. The outcomes of predictive policing are in compliance with local, state, tribal, and federal laws and regulations since the technologies are tailored to the relevant legal circumstances (Ioimo, 2018: 7). Additionally, existing resources can be used more effectively and resources can be conserved over time by utilizing underpinning software. This could also suggest that police officers are employed properly rather than necessarily making staff savings.Place-based predictive policing, the most often utilized method, frequently examines pre-existing crime data to identify regions and times with a high possibility of crime. Predictive policing, according to some, might help police departments save money by making crime-reduction programs more effective. "Predictive policing is a more rapid means of

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combating crime."The public values crime prevention more than responding to crimes and apprehending offenders. Although it is occasionally erroneously claimed that forecasts have little to do with crime prevention and are only useful to "catch" criminals, (Schwabe, & Schurink, 2000).

Systems for predictive policing, for instance, are capable of quickly processing massive amounts of data. Police officers now have more time to devote to other tasks like street patrol. The adoption of modern forecasting technology can streamline investigative processes in this way, and in the best case scenario, crime rates can be decreased through effective preventative measures.As a result, the following areas can benefit: police personnel management, such as professional deployment and recruitment; police budget management, such as measuring the costs of overtime and other expenditures; offender monitoring; city or neighborhood planning, such as design of spaces; police security resource allocation; or infrastructure protection (Uchida, 2010). For instance, the LKA of the federal state of North Rhine-Westphalia established the following goals for German police organizations during the PP project's implementation phase dubbed SKALA: Its goal is to conduct targeted, strategic police activity that uses well-known, crime-relevant variables to identify hotspots as they emerge.

Thus, the collecting of data is based on either person- or space-related data. Methods for forecasting crimes are included in location- and time-related forecasts; these techniques are used to identify locations and periods that are more likely to experience a certain criminal behavior (Perry et al., 2013, p. xiv).Aiming to pinpoint people who will commit a crime soon, approaches for predicting offenders go into detail. Profiles that precisely match likely offenders with certain historical crimes are the subject of research into identifying the perpetrators. It is possible to identify groups or individuals who are more likely to become victims of offenders using tools that predict probable crime victims (Perry et al. 2013, p. xiv).Despite the fact that forecasting capabilities can be divided into many groups, the techniques for subsequent application and execution are comparable. According to Perry et al. (2013), the PP process can be described as a traditional four-step comprehensive business cycle. as illustrated in picture 3. Data fusion is necessary for the first two processes, which deal with gathering and analyzing crime, incident, and offender data.

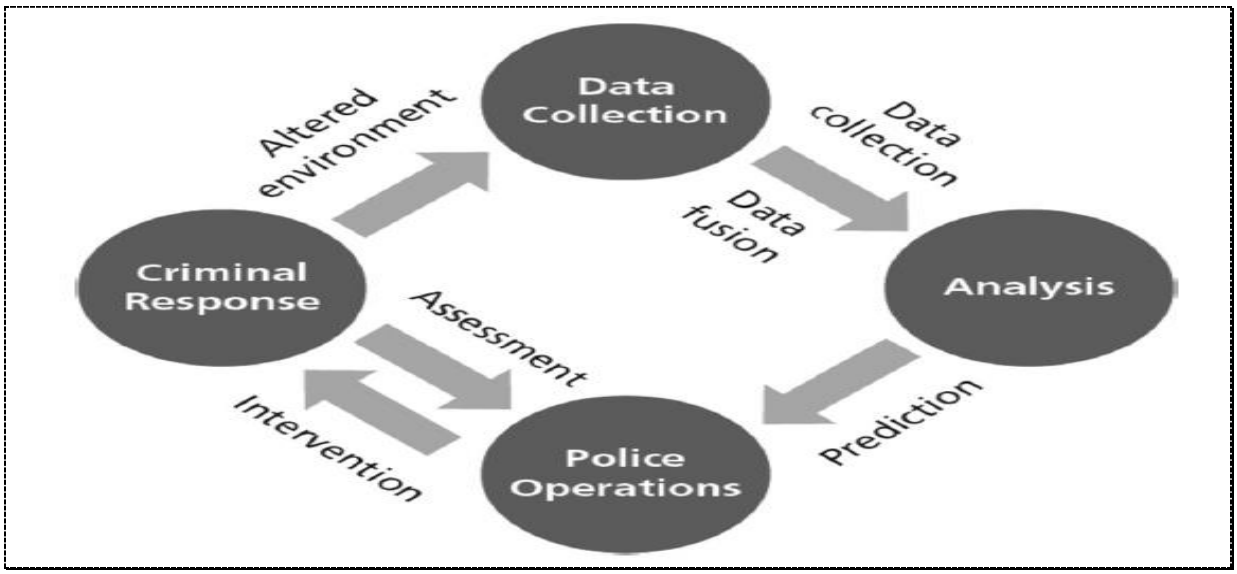

Fig. 1: Prediction-led process (Perry et al., 2013)

Four sections make up the cycle of gathering data, forecasting outcomes, and putting those outcomes into practice (see Fig. 1). The first step is the thorough gathering of quantitative data, which is necessary for precise forecasts; the second step is the actual analysis of the data; the third step is the prediction of crime; and the fourth step is particular police actions that aim to prevent crime by deterring offenders or arresting them.

Accordingly, "location-based or geospatial predictive policing" and "individual-based predictive policing" are the two subcategories that are typically used to separate out predictive policing (Sommerer, 2017). According to Ferguson (2017), "person-based predictive targeting" and "place-based predictive policing" are subcategories. According to Perry et al. (2013), the latter category can be further separated into techniques for predicting criminals, the identities of criminals, or the identities of crime victims. The strategic subject list (SSL) in Chicago, where a risk score was assigned to people who had previously been arrested, predicts a heightened probability of becoming engaged in future gun violence either as a perpetrator or a victim, is the most notable example of "person-based predictive targeting". The SSL had low predictive accuracy in the aforementioned "prediction-led policing business process," in addition to lacking instructions on how to integrate predictions into police operations (Saunders, et al. 2016).This finding emphasizes the need to consider the entire "prediction-led policing business process" when examining and evaluating predictive policing—whether it be "place-based predictive policing" or "person-based predictive targeting"—because each strategy can produce its own distinct if faculties throughout the process.

Only a few attempts have been made to evaluate implemented predictive policing strategies from an independent scientific perspective (for example, Saunders et al. 2016; Mohler et al. 2015). This is despite the fact that many police departments in various countries have been testing and using varying predictive policing strategies and that police statements and media reports frequently sound promising. Researchers from Germany (Gluba 2016; Belina 2016; Egbert 2017) and the US have also critiqued this (Perry et al. 2013; Ferguson 2017; Uchida 2014).

Thethird step entails actions taken by police institutions to stop the anticipated criminal activity or even to solve past crimes. The complexity of potential interventions is categorized into generic, crime-specific, and problem-specific components. Complex treatments, according to Perry et al. (2013, p. xviii), involve more resources, such as personnel, but produce better, more goal-oriented results. Managers should not only describe the crucial component of preventative analysis but also provide information that satisfies the requirement for situational awareness among officers and personnel in order to carry out missions successfully (Perry et al., 2013, p. xviii).The cycle's fourth stage can be finished by building on this. Each intervention results in a criminal response that, in the ideal scenario, reduces the danger or stops the crime. Here, a short-term feedback and assessment is taken into account by ensuring that the interventions are being implemented properly and that there are no obvious concerns. Reprocessing the newly obtained data following each operation is required for Predictive Policing to be effective over the long run, which in turn results in shifting environmental conditions.

Belina, (2016: 1-2) contend that this illustration does not fit the methodological standards as it is implemented in Germany, despite the fact that Perry et al.'s Prediction-Led Policing Business Process is meant to represent a comprehensive approach. The process is shown in the accompanying image, which was altered by scientists (Seidensticker, 2017: 96) and shows it from the viewpoint of the police (Belina, (2016:.2).The resources will determine whether or not the use of predictive policing methods is advantageous in the specific setting. As a result, it is essential to begin with a delinquency analysis and determine whether applications are appropriate (Seidensticker, 2017: 296). If the usage of the Predictive Policing tool proved worthwhile in this situation, the executors provide comments at the conclusion. Consequently, variations across federal states are always possible. The first step starts the gathering and processing of datasets as well as the examination and selection of data records.

Consolidation of space and time becomes essential. Police-related data that has already been recorded can be integrated with non-police data, including changes in the weather or temperature. It is crucial to geographically reference data for this use in order to ensure a consistent, machine-process able dataset that serves as the foundation for subsequent analysis. In the second phase, a specific statistical model is built using the available data, such as a regression or decision tree (Box, et al. 2015: 305).The third phase involves analysing the data based on the selected probability model. For example, the forecast calculation points out, which offence with an increased risk will take place in which area. Within the fourth step results of the prognosis are presented graphically for police officers and investigators. This can be done with proper dashboards on smartphones or tablets in order to utilize them ad-hoc.

The data can serve as a foundation for decision management depending on the present situation. Police officers can then put precise preventative measures into action. The last stage summarizes the applied modeling performance measurement, retains lessons learned, and confirms the veracity of intermediate results (Bode et al., 2017: 3). In contrast to Perry et al.'s Prediction-Led Policing approach, Bode et al.'s adaptation makes use of the feedback-culture and conducts continual evaluations at the end of each phase.However, if the goal is to catch a criminal in the act, for example, some forms of reactive policing may be better handled by predictive policing. Predictive policing, sometimes known as "crime forecasting," is the process of identifying or anticipating prospective criminal activity using statistical and analytical approaches.

The Santa Cruz police were the first law enforcement organization to employ predictive policing. Numerous police departments all across the world have implemented predictive policing in recent years, which uses statistical data to inform decision-making (Meijer, 2019). Predictive analytics and powerful computers are used to forecast crimes including auto thefts, property crimes, and burglaries. Thus, predictive policing poses some significant issues regarding the nature of prediction in a time where data gathering and analysis are pervasive (Ferguson, 2017).

As a whole, predictive policing appears to be the next step in the evolution of policing strategies rather than replacing officers or substituting existing policing strategies or models like "compstat," "evidence based policing," "problem oriented policing," "community oriented policing," or "intelligence led policing" (Ferguson, 2013; Pearsall, 2010). One can argue that Predictive Policing is only a component of a comprehensive strategy to combat crime in light of the fact that it does not always address the root causes of criminal behaviour.

According to Smith (2014), "Predictive policing" includes the following features:

- Predictive policing has been practiced by crime analysts, police personnel, and to some extent the general public for many years—since the very beginning of policing. People have generally always been able to make rational "predictions" about the likelihood of the next crime by using historical data about past crimes, the location, the time, and the criminal's behaviour. Even if modern technology can improve our ability to anticipate crime, in earlier times, the police relied on their own expertise and experience to make these predictions.
- Predictive policing has been practiced for many years in some labour-intensive forms (Perry, McInnes, Price, Smith, & Hollywood, 2013). Despite the fact that some people think it's a recent development. However, it is now

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possible to generate analytical data in real-time because to technology advancements (Smith, & Hollywood, 2013). Predictive policing is centered on data analysis. The literature frequently claims that predictive policing involves using algorithms that use sophisticated data analysis, geospatial information, complex mathematics, and, in some cases, anthropological and criminological behaviour research (Ferguson, 2013; Pearsall, 2010; Perry et al., 2013).The objectives of predictive policing are to predict, prevent, and minimize crime, to effectively address crime, and to define realistic goals for interventions (Perry et al. 2013; Pearsall, 2010. Some people are under the misconception that predictive policing will result in more arrests rather than fewer.

- Predictive policing systems not only employ data from various sources but also information from the police regarding crime. The choice of data can be problematic in and of itself, and ethical concerns regarding the use of predictive policing in the United States are becoming more and more prevalent (Pearsall, 2010).
- "Predictive policing is the collection and analysis of data about prior crimes for identification and statistical prediction of people or geographic areas with a higher probability of criminal activity to help develop policing intervention and prevention strategies and tactics." Albert Meijer and Martijn Wessels, 2019: 3.
- Predictive policing tactics are enticing LEAs, their partners, and other stakeholders in crime prevention to examine the gathering and potential use of various data sources more critically. Predictive policing has created ethical questions in the US, though, and its use in European contexts has raised some worry.

Then, how does predictive policing differ from conventional approaches and police tactics? Some hints can be found by examining the various definitions that practitioners and academics have come up with for predictive policing. Predictive policing, according to Bratton, et al. (2009: 3), is "forward-thinking crime prevention" that "connects technology, management practices, real-time data analysis, problem solving, and information-led policing to lead to results" such as crime reduction, effective agencies, and contemporary and innovative policing.

Predictive policing is defined similarly by Uchida (2009: 1) as a "multidisciplinary, law enforcement-based strategy that brings together advanced technologies, criminological theory, predictive analysis, and tactical operations that ultimately lead to results and outcomes - crime reduction, management efficiency, and safer communities."

"Massive crime reductions following increased arrests will necessarily result from accurate predictions (within predictive policing)," This clarifies the concept of predictive policing since it involves more than simply analysis and also involves police action. The only output of using crime data analysis to make forecasts is, in fact, just a prediction. Police must take action, with all the complications that entails, in order to minimize crime (Perry, McInnes, Price, Smith, & Hollywood, 2013).

Additionally, Predictive Policing may involve allocating resources in response to anticipated increases in crime. It is possible to identify specific crime patterns or predict the mass release of criminals from jail (Smith, 2014). However, in actuality, the officer may have altered the surroundings in response to the predicted counsel. Crime is deterred by the consequences of being in a potentially criminal environment, which may even result in fewer arrests (Smith, 2014). As the potential offenders are not apprehended but rather the potential crime is prevented, this may give the police officers an instinctive sensation of failure.

Boba, (2009), had actually claimed that "do[ing] more with less" would be the key to innovative approaches to crime analysis and prevention. In this context, technological innovation was widely seen as a potential means of enhancing police work through more targeted and informed ways of acting (Beck and McCue, 2009; Bratton et al., 2009; Saunders et al., 2016).

Thus, from its inception, the foundation of predictive policing was largely based on commercial logics. Predictive policing has been characterized as an internal management tool that harmonizes police work with contemporary business processes in order to boost efficiency and effectiveness (Saunders et al., 2016), which is one interpretation of the practice that some have advanced in light of these motives. Others have highlighted the purported impartiality of algorithms as a motivating factor (Shapiro, 2019).As stated by Ferguson (2017: 21ff), the adoption of predictive policing in the US was in reality influenced by a number of factors, not the least of which was the rising hostility between law enforcement and racial and ethnic minorities, particularly in the wake of the Black Lives Matter movement. In this light, predictive policing was viewed as a technique to eliminate human prejudice and allow a machine to pick who to regulate and where to patrol. Of course, there is no such thing as an impartial algorithm, and numerous studies over the past few years have shown how bias creeps into algorithmic decision-support systems in policing and criminal justice in a variety of ways (Angwin et al., 2016; Lum and Isaac, 2016; Richardson et al., 2019).

The focus of the literature review will be on two ends of a spectrum that can be characterized in accordance with the proposed definition of predictive policing. Statistical analytics, which uses complex arithmetic and algorithms to forecast future crime, might be seen as being at one end of the spectrum. Intuition, which is the other extreme of the spectrum, is unconscious human analysis based on experience.The technical, economic, and political pathways that predictive policing adopts are numerous. Algorithmic crime analysis techniques are frequently advocated as a sophisticated solution to organizational problems and outside influences. Therefore, it is not unexpected that over the past ten years, predictive policing has extended swiftly to numerous local and national contexts all over the world.

In conclusion, approaches that are more reliant on person-related datasets include methods for forecasting criminals, the identities of criminals, and possible victims of crime. Methods for predicting offenders specifically try to identify those who will likely commit a crime in the near future. On the other hand, identifying the perpetrators focuses on profiles that precisely match likely offenders with certain past crimes.

Groups or individuals that are more likely to become victims of an offender can be identified using tools that predict probable crime victims (Perry et al. 2013, p. xiv). Despite the fact that forecasting capabilities can be divided into many groups, the techniques for subsequent application and execution are comparable. According to Perry et al. (2013), the PP process can be described as a traditional four-step. Data fusion is necessary for the first two processes, which deal with gathering and analyzing crime, incident, and offender data. The data will be analyzed in accordance with the various police activities and divisions to make precise predictions.

V. POSSIBLE ADVANTAGES OF PREDICTIVE POLICING

Law enforcement organizations use these methods to more effectively and efficiently use their resources, which is how predictive policing is envisaged with broad potential benefits built in. Andrejevic, 2017) claim that predictive policing can enable police forces to intervene by identifying patterns in vast data sets. We reviewed the literature and identified the specific claims.

The more accurate allocation of resources in both space and time is the first distinct advantage of predictive policing. To identify high-risk areas, predictive policing methods that employ both previous crime data and a wider range of data are used. For example, risk terrain analysis and advanced hot spot identification techniques are used to identify the areas where criminal activity is most likely to take place. Both criminal data and data from data mining are crucial for this geospatial analysis: they are data that don't immediately matter but could help with crime prevention and prediction (Andrejevic, 2017).

These numerous data sources can also be used to identify the times of day when criminal behaviour is most likely to occur through the use of spatiotemporal analysis. These algorithms are intended to forecast the peak period of criminal activity in a specific area. However, the research also shows more specific patterns. Near-repeat crimes are the idea that following crimes are more likely to happen close to the time and place of current crimes.

Dario, Morrow, Wooditch, and Vickovic (2015) looked into the connection between crime and favourable surfing conditions in California (i.e., weather conditions that entice locals, visitors, and surfers to surf areas). The Ventura Police Department's historical criminal data was used. They determine that the weather does, in fact, enhance crime in these areas, but only from 2:30 to 5:29 pm (Dario et al., 2015: 271). Similar conclusions were reached by Haberman (2017), who noted that the risk of armed robberies occurring again within seven days increases initially but then decreases.

The analysis of geography and time serves as the foundation for resource deployments. A Decision Support System (DSS) was created by Camacho-Collados and Liberatore (2015) in conjunction with the Spanish National Police Corps to effectively disperse police officers across a region. They attempted to provide a solution to the Police Districting Problem (PDP), which is the issue of how police officers can best identify the patrol sectors where there is the greatest likelihood of criminal activity.

The authors' DSS-model can be used to more effectively assign police officers and choose the best patrol routes. The authors' system was put to the test as part of their research, and they came to the conclusion that it could deploy police troops more effectively across the city. Although this approach appears to be very promising, it still needs to be used in the real world before its true worth can be assessed.

Predictive police tactics are said to assist in identifying people who may be involved in criminal activity, either as a victim or an offender, in a second specific claim. According to Perry (2013), predictive algorithms can be used to identify members of criminal organizations that have a higher than average likelihood of engaging in violent conflict (such as gang shootings). Inductive profiling is another tool that can be used to identify people who may later commit crimes (Van Brakel & De Hert, 2011). With the use of these methods, those who exhibit characteristics that are associated with a higher likelihood of engaging in criminal behavior can already be watched or targeted (Perry, 2013). This profile goes beyond only looking at an individual's demographics; it can also include their (social) behavioural habits (Van Brakel & De Hert, 2011).

Kump et al. (2016: 156) used his research to show that sex offenses are most commonly clustered in the offenders' activity zones (i.e., places where people frequently go). Based on a more in-depth investigation, Kump et al. showed through social network analysis that people are more likely to commit crimes for a length of time (about 25 weeks) if they are socially related to an offender to a certain extent. Similar conclusions on social media and criminal activity are reached by Williams, Burnap, and Sloan (2016: 337), who discover a correlation "between aggregated open-source communications data and aggregated police recorded crime data in London."

VI. PITFALLS/ DRAWBACKS OF PREDICTIVE POLICING

Predictive policing can bias police personnel by spotlighting high and low-risk neighborhoods, placing them on unnecessarily high alert or giving them a false sense of security. Predictive policing has an effect on neighborhood residents in addition to criminals and law enforcement personnel. While many academics and police departments are persuaded that predictive policing has a bright future, some academics have expressed some reservations about the use of data mining and algorithms to anticipate criminal

conduct. These issues will be examined, and it will be established whether or not they are grounded on fact or merely on speculative assumptions. We only mention this distinction if it is particularly highlighted because many of these possible downsides apply to both the spatial-temporal forecasts and the profile.

Due to the predictive policing models' lack of openness, it has been noted in the literature that law enforcement agencies are unable to completely understand the algorithms (Datta, Sen, & Zick, 2016; Schlehahn et al., 2015). Riskier is not the same as risky (Saunders et al., 2016), hence it may be difficult to assess how risky geographical areas or specific individuals are if the models are not understood by law enforcement organizations. The efficiency of law enforcement efforts may be compromised if they are unaware of the elements that raise the likelihood of crime (Perry, 2013).In order to establish appropriate strategies, law enforcement organizations must also ensure that the data is properly interpreted and that appropriate inferences are made from it (Townsley, et al. 2023).

Predictive models are typically data driven rather than theory driven, which mayhave significant effects on how these models are applied. The use of big data and data-based methodologies could result in an overemphasis on correlations rather than causality (Andrejevic, 2017). This might be a concern because forecasts based on algorithms are ambiguous and challenging to understand (Chan & Bennett Moses, 2016). The models will be out of date and give a distorted view of reality if they are not analyzed and appraised using practical insights such as the tacit knowledge of police officers (Perry, 2013).

As previously mentioned, the Saunders et al. (2016) study also suggests that predictive algorithms might not be self-explanatory. Although the interaction with potential offenders increased, one of the reasons they did not find substantial results may be because the models do not offer enough guidance on how to deal with these offenders or how the models should be applied. This supports the idea that the predictive models can never be utilized independently without additional guidance for police officers regarding how to behave in public, which reduces their efficacy.

Accountability issues could develop if prediction models are not transparent or understood. Bennett Moses and Chan (2016) bring up the potential repercussion that law enforcement may not be able to properly comprehend and interpret the software's results and may not view them as sufficient information for making decisions. This can result in an accountability gap if police officers are unable to recognize flaws in the models because they do not comprehend them. In other words, when complete dependence is placed on predictive algorithms, it becomes unclear who is in charge of making decisions.

Because of the lack of transparency, using a predictive policing model for profiling may stigmatize people and groups, leading to automated forms of prejudice. When predictive models are applied incorrectly, law enforcement officials may overlook and underestimate the effect since it may result in the stigmatization of some people (Schlehahn et al., 2015). In their study, Schlehahn et al. (2015) offer a fictitious illustration of how the acts of law enforcement agencies might affect the resocialization of ex-offenders.They present a convincing case for how the stigmatization of some categories of criminals might cause aversion and, ultimately, relapse in criminal behavior as their reintegration into society is slowed down by these prediction algorithms and how officers handle them. Because it encourages criminal activity, individual profiling may ultimately have a self-fulfilling outcome.

Predictive policing practices may sometimes have unforeseen repercussions when used. A startling result was reached by Edwards and Urquhart (2016) after comparing two data-driven programs, one of which dealt with predictive policing. He examined the Kansas City No Violence Alliance (KCNOVA), which employs network analysis software to pinpoint those who are most likely to engage in criminal activity, and a living lab in Kansas's downtown that aims to raise living standards and encourage capital investment in this area of the city.According to Brannon (2017), the use of predictive policing in one geographic area of the city has an effect on both this space and its occupants: when one area is keeping an eye on criminal activity while the other is thriving due to the encouragement of capital investments, this causes spatial inequality across racial and social classes.

More basic concerns about privacy and ethics are raised after the practical challenges that come with the use of predictive algorithms. Edwards and Urquhart (2016) examine whether it is appropriate for law enforcement authorities to use social media and open source data, as well as how well protected citizens' digital identities are. The writers dispute the degree to which citizens' digital footprintssuch as what they post on social media and data that can be gathered about our transit movements—are private and whether it can be utilized indefinitely.

The difficulties between social profiling of individuals and legal protectionswhich are frequently relaxed to address these tensionsare discussed by Lammerant, & de Hert, (2016).Even while the legal limits of predictive profiling are fairly obvious thanks to privacy law, there are still a few isolated instances that make it difficult to draw clear lines around who is qualified. Costanzo, D'Onofrio, and Friedl (2015) highlight this conclusion by arguing that regulation is crucial to maintaining confidence between citizens and governments since there should be a balance between the use of big data and citizens' privacy. Citizens may grow deeply suspicious of governments if there are no limitations because they are unsure of whether and how much they are being watched (Schlehahn et al., 2015).

Predictive policing can bias police personnel by spotlighting high- and low-risk neighborhoods, placing them on unnecessarily high alert or giving them a false sense of security. The following predictive policing pitfalls affect neighborhood people other than criminals and law enforcement personnel:

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- The researchers asked respondents in a study that was published in the British Psychological Society whether they felt more or less comfortable among police officers. They came to the conclusion that "the presence of a police officer could serve as a warning signal, drawing attention to possible danger in the area."
- As a result of their use of skewed data, the existing applications of predictive policing contradict the moral principles of justice and fairness.
- Regardless of the location of the police, if there are more police on the streets, criminal activity will be reduced. As a result, the success of predictive policing cannot be directly linked to its success. The opposite of what is theoretically intended, though, may also happen as law enforcement activity rises in a neighborhood. Ironically, the increased police presence might make people feel unsafe by instilling fear.
- This ethical framework is one useful technique to assess the efficacy of predictive policing and determine whether the strategy is morally acceptable. Based on a big database of past crime data, predictive policing predicts where crime will most likely occur. The previous arrests must be impartial in order to produce impartial forecasts because the software relies on outdated data. When crucial information and context are missing, crime data may be skewed in one way or another.
- Data on past crimes can also reveal racial bias. For the same crime, persons of colour are arrested much more frequently than white people. Compared to white individuals, black people were five times more likely to be arrested by the police. In communities where there are more arrests of persons of colour, racially skewed arrest data produces racially biased forecasts. For instance, even though drug usage rates "are essentially the same across Oakland neighborhoods," a simulation research on predictive policing in Oakland, California, included a prediction algorithm that advised more police should be sent to neighborhoods with a high concentration of Black and Latinx residents.
- Predictive policing encourages overpolicing in communities of colour, which serves to legitimize the fundamentally unjust structural racism that afflicts this nation.
- As a result of predictive policing, more people are arrested, which exposes them to "countless fines, fees, and other costs" that they frequently cannot afford.
- In addition, people with criminal records are unable to vote, obtain a driver's license, or look for employment.
- In general, the justice system unfairly prevents persons of colour and those living in poverty from re-entering society after committing crimes. Law enforcement can increasingly target those who are already having difficulty thanks to predictive policing.
- Victims of predictive policing are chosen based on bias, and those who employ the practice may develop deadly bias. If an officer is aware that they are in a high-risk area, they may interpret an activity that is not typically suspicious as threatening.
- Predictive policing has a negative effect on this safety issue. Even if there are more police patrols, more individuals feel frightened as a result. Inundating a town with police patrols can have a direct detrimental effect while not necessarily reducing crime. Overall, it is unethical to utilize predictive policing since it makes residents feel insecure in their areas while police are there.
- This might also go the other way; in a low-risk area, an officer might mistake suspicious activity for nothing. Predictive policing can bias police personnel by spotlighting high- and low-risk neighborhoods, placing them on unnecessarily high alert or giving them a false sense of security.
- Examining the effects of this technology is crucial to comprehending predictive policing in the context of this ethical framework. Predictive policing, from the standpoint of the police, helps to pinpoint potential crime hotspots. However, even if initiatives like LASER may produce promising outcomes, predictive policing may not necessarily be to blame for any particular drop in crime rates.

Predictive policing has an effect on neighborhood residents in addition to criminals and law enforcement personnel. Some may believe it is true that more crimes are being committed voluntarily by residents of high-risk areas, and that this justifies the increased police presence in certain areas. However, this viewpoint makes generalizations about an entire neighborhood or community based on the few criminals that actually exist.

VII. KEY FINDINGS OF THIS ARTICLE

- Predictive policing is the application of analytical techniques to identify promising targets for police intervention, with the goal of reducing crime risk or solving past crimes.
- Predictive policing techniques can be used to identify places and times with the highest risk of crime, people at risk of being offenders or victims, and people who most likely committed a past crime.
- To be effective, predictive policing must include interventions based on analytical findings. Successful interventions typically have top-level support, sufficient resources, automated systems to provide needed information, and assigned personnel with both the freedom to resolve crime problems and accountability for doing so.
- Many agencies may find simple heuristics sufficient for their predictive policing needs, though larger agencies that collect large amounts of data may benefit from more complex models.

VIII. RECOMMENDATIONS

The knowledge gained from these other domains can be used to highlight the numerous known traps that might mislead practitioners and offer suggestions to improve the efficacy of these techniques:

- Concentrating on Prediction Accuracy Rather Than Tactical Utility: Using research from RAND into counterinsurgency operations in Iraq as an example, a computer model predicted that an IED event will take place somewhere in the city of Mosul within the following 48 hours. While true, it information was rarely tactically

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useful. Practitioners should generally concentrate on generating conclusions that have tactical utility while conducting tactical analysis. This means that the analysis's scale should correspond to the range of potential responses. A beat officer, for instance, is probably able to handle a few hotspots the size of a city block but would not find it feasible to concentrate on a strip several miles long.

- Relying on Bad Data: Systematic mistakes in the data will result in systematic mistakes in the analysis. It will look that there is no crime in particular places if data are excluded. Since department analysts can identify issues in the output that would cause these kinds of systemic errors, it is crucial for police departments to comprehend the ground truth when doing these studies. Positional accuracy of geocoded crime events is a crucial element in predictive crime mapping, according to a research of more than 400,000 criminal incidences from six sizable law enforcement jurisdictions in the United States.
- Misunderstanding the Prediction's Causing Factors: Using common sense to verify the elements included in the model before applying techniques like regression or any of the data mining variations will assist avoid erroneous correlations. Additionally, it's critical to be curious about the factors that influence forecasts in order to uncover deeper connections. For instance, comparing crime statistics to police officer locations would probably reveal a strong association between where crimes occur and where police have been stationed.This does not imply that we can determine where crimes will occur by looking at the position of police, as officers are typically called to a scene after a crime has already occurred. This association will therefore probably be quite strong, but it doesn't offer any valuable information for forecasting.
- Underemphasizing Assessment and Evaluation: Follow-up information on both crime incidences and police responses must be gathered in order to evaluate the efficacy of crime analysis suggestions. With the knowledge that police reactions to the forecasts may have an impact on the outcomes, the predictive models can be tested on these outcomes over time. For instance, follow-on analysis can be performed to determine the effectiveness of an intervention in a specific area after a hot spot has been discovered and a solution has been implemented. Police resources may be better allocated elsewhere if the hot spot has been successfully repressed for any reason. The reason the hot spot was suppressed, such as a modification in the circumstances or environment, the arrest of a repeat or career offender, or another factor, may have an impact on the form of the readjustment. Alternately, if the hot area continues, a different intervention should be thought about, and more assessments will be required. It's also vital to assess and evaluate assertions made about approaches and software.A vendor might assert that once its software was used, crime in a city decreased by x%. This remark might have been accurate even if the city had not employed the program due to larger trends in crime. Any claim of these tools' usefulness should be viewed with a fair dose of skepticism in the absence of adequate evaluations.
- Neglecting Civil and Privacy Rights: Taking action in hot locations is easier than worrying about civil and privacy rights when using comparable methods to locate "hot people." What should be done when a parolee is predicted to have a high probability of reoffending even if the forecast is still far from certain despite being much better than chance? The typical response up to this point has been that law enforcement is mostly free to conduct legitimate investigations and take preventative measures against high-risk individuals because the majority of them are already under some type of correctional supervision (or are at the very least convicted offenders. Again, it's unclear exactly what being "reasonable" means and under what circumstances. We think that over the next few years, there has to be a lot more study and development done in this area.

IX. CONCLUSION

One of many policing tactics will continue to be predictive policing. It is necessary to temper the lofty ambitions of this relatively new subject with pragmatic realism. To maximize the return on the necessary technological investment, predictive policing must also be properly examined, monitored, and adjusted. Predictive policing models must take into consideration a variety of factors because crime is a complicated phenomenon that is influenced by many different things. This might affect the accuracy of forecasts. Police data (and other data sources) predictions are simply risk probabilities and do not offer a clear window into the future.

Predictive policing is a policing method or model that tries to forecast, prevent, and minimize crime, have an effective reaction to crime, and identify feasible policing operations, according to the research literature. The use of predictive analytics is a smart strategy to achieve this. Gathering pertinent and correct data, appropriately processing it in a computer model, and then carrying out a good analysis for the direction and allocation of resources are the steps involved in becoming ready for upcoming shifts. Advanced and sophisticated algorithms supported by computer technology are used to carry out this operation. The mathematical model's accuracy as a representation of reality and its internal consistency are its key bottlenecks.However, due to a natural inability to understand statistical probability, the intuitive predictions may be prejudiced. Instead of doing this, the brain has evolved to use holistic associations. Which move quickly and with little effort. When police personnel are disproportionately exposed to several sorts of crime, the availability heuristic that creates a distorted perception of reality can also affect intuition. This could result in poor choices. On the other side, this can be enhanced and debiased if police officers assume a conversation with an analyst. Police officers with experience and knowledge do exist, and to some extent, they can offer appropriate guidance.

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