AINA

Magazine
AI and Analytics

Meet
Josh
Starmer
The founder of "Statquest"

Urban Analytics
How AI can help in creating smart cities of the future

Synthetic Data
Artificially generated data to train the next generation of AI models

Privacy in ML
Techniques to preserve privacy while maintaining model performance

Algorithms to Allies

Shaping The Future of Policing

B.N.K. Goutham

Timeless Relevance of Law and Order

Law and order is a concept that has been around since time immemorial, but it has never been more relevant than today. As societies grapple with complex challenges, the need for a structured framework to maintain peace and stability becomes more apparent than ever. It came into existence from the assumption that humans possess inherent inclinations toward self-interest and violence. Beyond preserving societal balance, it presents a cautionary vision of a dystopian future, underscoring the criticality of maintaining a just and regulated system. Imagine a society where law and order don't exist in society. Where people can do whatever, they want, without any consequences. Where violence, chaos, and anarchy reign supreme. Where survival is the only goal and morality is a luxury. This is a world where fear, greed, and selfishness are the only laws. Where justice, peace, and harmony are only dreams. These societies still exist in our modern world, where people have no rights and are living in constant fear.
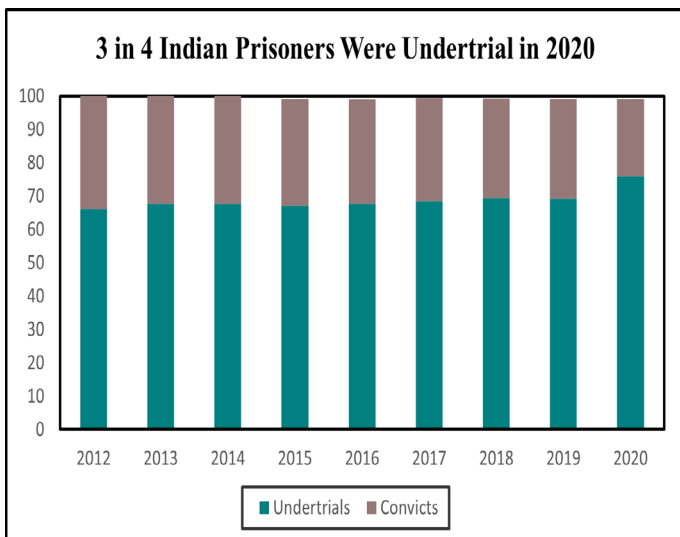
Unraveling The Maze: Shortcomings

Illeterate 25% · Below Class X 43% · Class X & above 32%

More than 50% undertrials are literate and more than 32% studied class X or above

While extreme cases of lawlessness and chaos may be more commonly associated with monarchies and anarchies, it is important to recognize that even in democracies like India, there exist certain shortcomings in maintaining law and order. One small example of this aspect is the bottlenecks faced by Indian Police and prisons. The police force acts as the cornerstone of this foundation. However, the police force faces several challenges, particularly in a middle-income country like India, where resource and budget allocation are key issues. According to a report from the National Crime Record Bureau (NCRB), there has been a significant increase (approximately 15%) in the number of undertrials in Indian prisons. This can be attributed to inefficient resource allocation, accumulation of pending cases, and lack of awareness about one's rights.

specific to certain types of crimes, such as the IT Act, POCSO, and Wildlife Protection Act. With such a vast amount of legal data, it is humanly impossible to be well-versed in all aspects of the law. While individuals are typically knowledgeable about crimes that made headlines, there is a lack of aware-

> "Society cannot exist unless a controlling power upon will and appetite be placed somewhere, and the less of it there is within, the more there must be without."
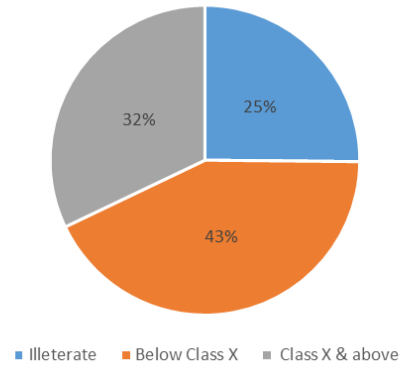>
> - Edmund Burke

Given these budgetary constraints, enhancing the efficiency of the law enforcement mechanism becomes crucial to maintain law and order. Another example of this aspect is the legal illiteracy of the Indian Population and the pile of legal Documentation in India. Currently, India has four main legal codes: the Indian Penal Code, the Code of Criminal Procedure, the Evidence Act, and the Code of Civil Procedure. In addition, there are numerous other laws
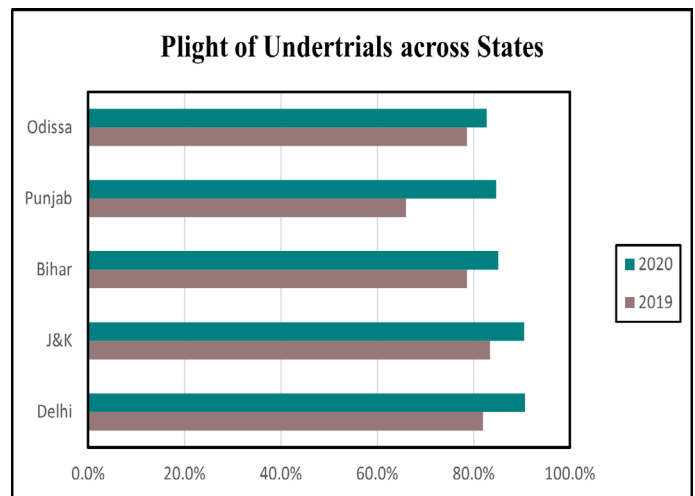

Plight of Undertrials across States

In the year 2020, close to 91% Prisoners in Delhi are undertrials

3 in 4 Indian Prisoners Were Undertrial in 2020

Constant rise in the % share of undertrials in Indian Prisons overtime years

ness regarding other criminal incidents that occur. Lawyers and lawmakers also often find navigating through numerous legal codes, specific laws, and past judgments tiresome. An additional problem is the lack of awareness regarding laws and the legality of issues. Surprisingly, a significant proportion of prisoners (around 52%) are literate, having received education up to at least class X. However, many of them remain unaware of their Fundamental Rights, leading to unfair treatment.

How is AI helping us?

With the recent revolution in AI, its applications are creeping into every field irrespective. This is the case with law and order too. For example, the legal chatbots. chatbots utilizing Natural Language Processing (NLP) and Entity Recognition-based models can offer preliminary legal advice and guidance to individuals. For instance, they can provide information about basic legal procedures, explain legal terms, or direct users to appropriate resources for further assistance. Legalbot is one such example of this. The applications of NLP and ER models extend beyond chatbots; they are also employed in legal research and contract review. NLP-powered legal research aids in identifying relevant laws, statutes, and precedents, while AI automates the review of contracts, reducing the likelihood of errors that may occur during the manual review. Apart from these, the adoption of AI/ML in law enforcement is rapidly advancing, particularly in areas involving large amounts of routine administrative work.

Another significant example of AI and ML in law enforcement is crime prediction. Since the 18th century, efforts have been made to identify patterns in crime using basic mapping techniques. Crime locations were manually plotted on maps to analyze crime concentration and distribution. In recent years, Artificial Intelligence has advanced to the point where police can even predict crimes before they occur.

Ailiria is an Australian company offering legal advice through chatbots
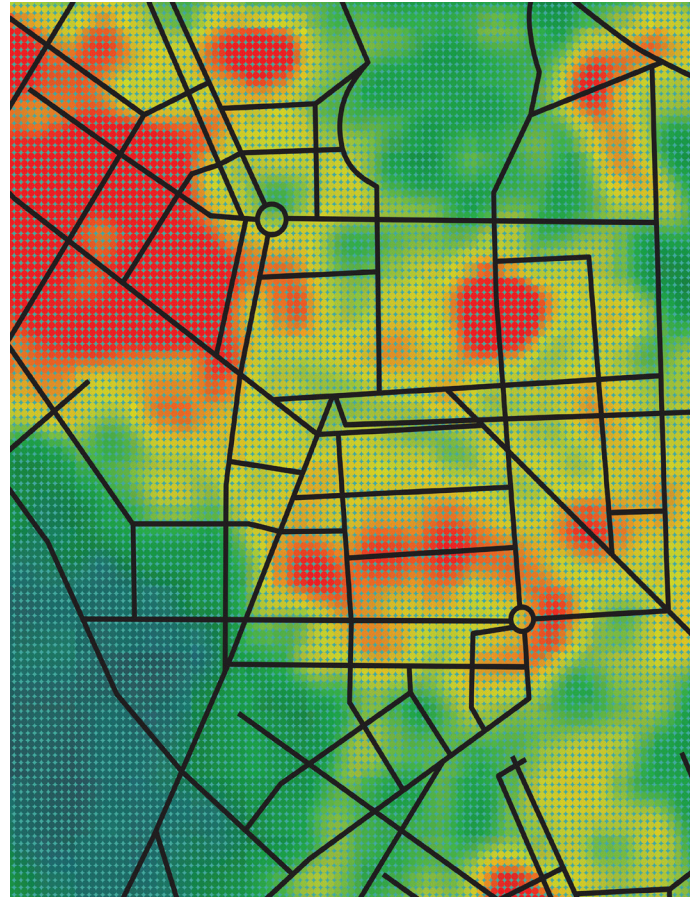
Crime Mapping in the very initial years.

Unlocking Tomorrow's Secrets: Can Data Analytics Predict Crime?

A persistent regret following the occurrence of a crime is that it could have been prevented if we had been aware of it sooner. Even in societies with highly efficient law enforcement systems, this lamentation remains prevalent. However, with the growing scope of predictive analytics, we are edging closer to realizing this dream of predicting crimes before they happen. How is this possible? The simple answer is data. Crime surveillance and data collection have always been integral to policing, whether in societies with highly efficient law and order or in more chaotic environments. Since the 1970s, various types of criminal cases, their locations, times, and dates have been recorded. This constant record-keeping of crime has revolutionized the application of technology in policing. **But how does this data actually help in policing?** By leveraging past crime data, hotspots can be identified based on the type of crime. These hotspots indicate areas with a high likelihood of different crimes.

1850
Minor Developments

Fletcher, in 1849, and Henry Mayhew, in 1861, produced maps that showed rates of male incarceration and county crime, respectively.

1950s
Place-Based Research

Jane Jacobs examined the built (urban) environment and the needs of city dwellers. In her work, she introduced constructs that are still used in today's place-based research, such as "eyes on the street" and "social capital."

1975
Environmental Criminology

Paul and Patricia's environmental criminology theory posits that crime is a complex event with four intersecting things: a law, a person motivated to commit a crime, a target, and a place. The propositions lead to the idea that place not people is the key element in crime

1829-2020

1829
The very first instance of Crime Mapping

Adriano Balbi and André Michel Guerry created maps that depicted the correlation between educational attainment and rates of violent and property crimes in France.

1910
Mapping Juvenile Delinquency

Clifford Shaw and Henry McKay mapped thousands of incidents of juvenile delinquency and analyzed the relationships between delinquency and various social conditions.

1970s
Place-Based Research in Criminology

Criminologists began to emphasize the importance of place. Due to the consistency in our routines, Cohen and Felson argued, we should be able to forecast crime: "The spatial and temporal structure of routine legal activities should play an important role in determining the location, type, and quantity of illegal acts occurring in a given community or society."
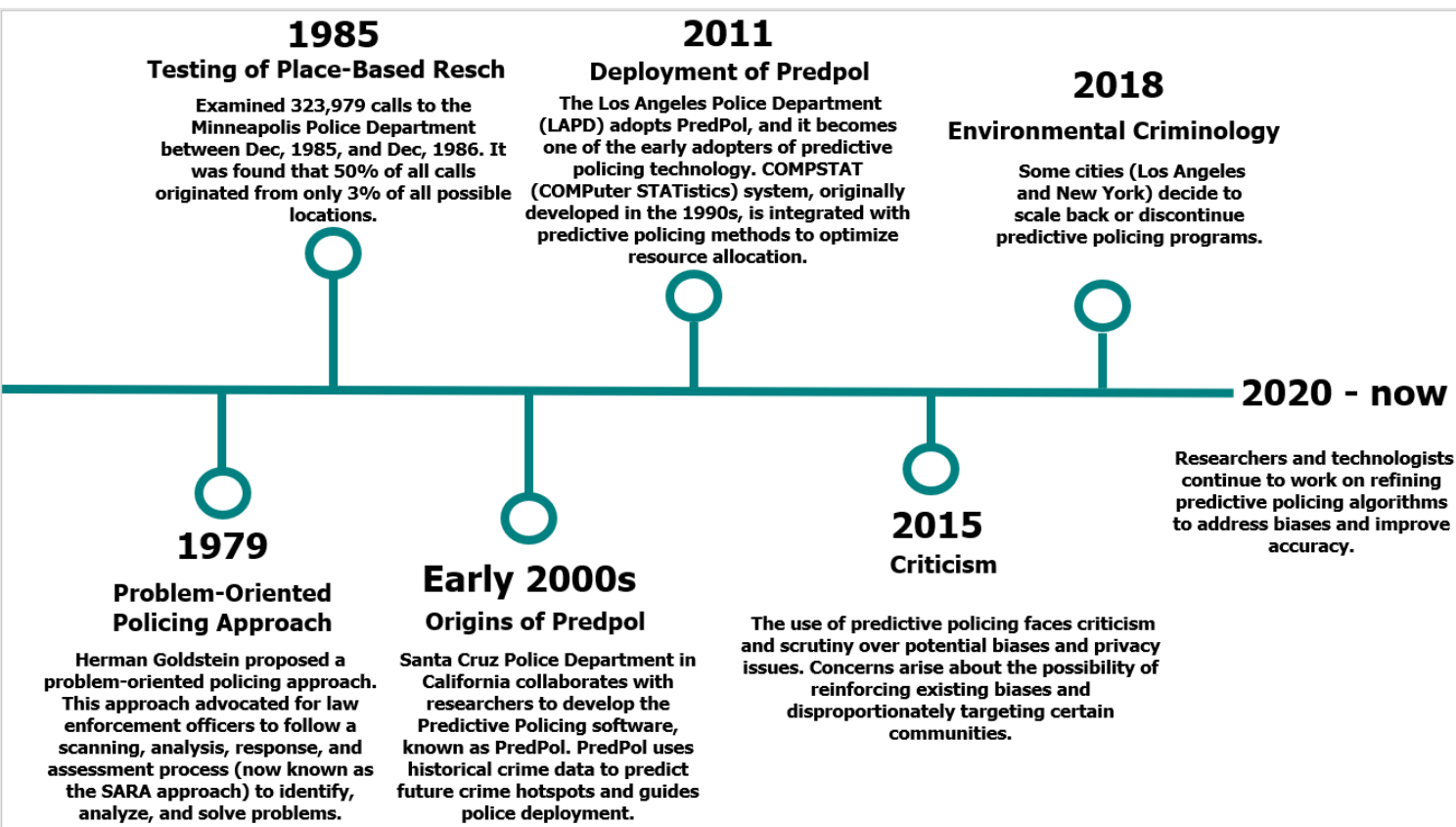
The Pathways:
Types of Predictive Policing

Predictive policing can be broadly categorized into two types: location-based and person-based. As mentioned earlier, location-based predictive policing focuses on identifying high-risk areas or hotspots where criminal activities are more likely to occur. High-risk zones are identified using historical data. More resources and patrolling will be allocated to these specific locations. All this started in the 1970s when the significance of place in the occurrence of crime was realized. The environment criminology theory has put place as the fourth dimension of crime (after person, target, and law). Between December 1985 and December 1986, a total of 323,979 calls were examined by Minneapolis Police Department. Through analyzing real addresses and intersections, the research team discovered that a mere 3% of all potential locations accounted for 50% of all reported calls. From here, research on location-based predictive models has started to shape up. With the increasing computation, model building has become much more simplified. By the year 2005, Los Angeles Police Department has implemented the first model (Predpol) of predictive policing. Person-based predictive policing involves focusing on identifying the persons who are at high risk of committing crimes or becoming vic-tims. Data for this is derived from various sources like criminal records i.e., individual's past arrests, convictions, demographic data, geographic data, social network data, probation data, etc.

The Los Angeles Police Department implemented the first model of predictive policing in 2005

1985

Testing of Place-Based Resch

Examined 323,979 calls to the Minneapolis Police Department between Dec, 1985, and Dec, 1986. It was found that 50% of all calls originated from only 3% of all possible locations.

2011

Deployment of Predpol

The Los Angeles Police Department (LAPD) adopts PredPol, and it becomes one of the early adopters of predictive policing technology. COMPSTAT (COMPuter STATistics) system, originally developed in the 1990s, is integrated with predictive policing methods to optimize resource allocation.

2018

Environmental Criminology

Some cities (Los Angeles and New York) decide to scale back or discontinue predictive policing programs.

2020 - now

Researchers and technologists continue to work on refining predictive policing algorithms to address biases and improve accuracy.

1979

Problem-Oriented Policing Approach

Herman Goldstein proposed a problem-oriented policing approach. This approach advocated for law enforcement officers to follow a scanning, analysis, response, and assessment process (now known as the SARA approach) to identify, analyze, and solve problems.

Early 2000s

Origins of Predpol

Santa Cruz Police Department in California collaborates with researchers to develop the Predictive Policing software, known as PredPol. PredPol uses historical crime data to predict future crime hotspots and guides police deployment.

2015

Criticism

The use of predictive policing faces criticism and scrutiny over potential biases and privacy issues. Concerns arise about the possibility of reinforcing existing biases and disproportionately targeting certain communities.

The Trailblazing Journey

Predpol is the earliest predictive analytics algorithm used in predictive policing. It is based on a decade of detailed academic research into the causes of crime pattern formation. Thus, research was successful in linking the key aspects of offender's behavior to mathematical structure that is used for predicting the pattern in the evolution of crime from day to day. In Predpol, only the historical crime data is considered for model building.

Five data points are used from each incident used for predictive analytics.

Incident identifier: Unique ID given to every incident by department (Acts as primary key).

Crime Type: Crimes are segregated into various categories. This category is taken as one of the input parameters.

**Location of Crime:** Latitude and longitude are used for better accuracy.

Time stamps: The exact time of occurrence of crime is not known in all cases. To counter this, we use time stamps i.e., the beginning date, time, and ending date and time.

Record modified date or time of incident: In case of any changes in timestamps, this is used. Predpol's

algorithm uses these as input points, and divides the whole space into small grids, with a size of 500 square feet. The crime is predicted in these boxes/clusters. Since different kinds of crimes are considered, respectively required police force and resources are calibrated.

Building upon the foundation of PredPol, a more advanced technique called Risk Terrain Modeling (RTM) has been developed. While PredPol uses only uses past data of crimes as a parameter to predict the crime, Risk Terrain Modelling uses spatial analysis considering various environmental factors like socio-demographic data, that contribute to the occurrence of crime, as a parameter to predict the occurrence of crime.

In the context of Risk Terrain Modelling (RTM), the identification of environmental factors extends to highly specific elements, including the proximity to public transport, local weather conditions, and other precise contextual details. These factors are carefully considered to gain a nuanced understanding of the spatial dynamics that may influence crime occurrences. By incorporating such granular information, RTM enhances the accuracy and effectiveness of predictive policing strategies, allowing law enforcement agen-
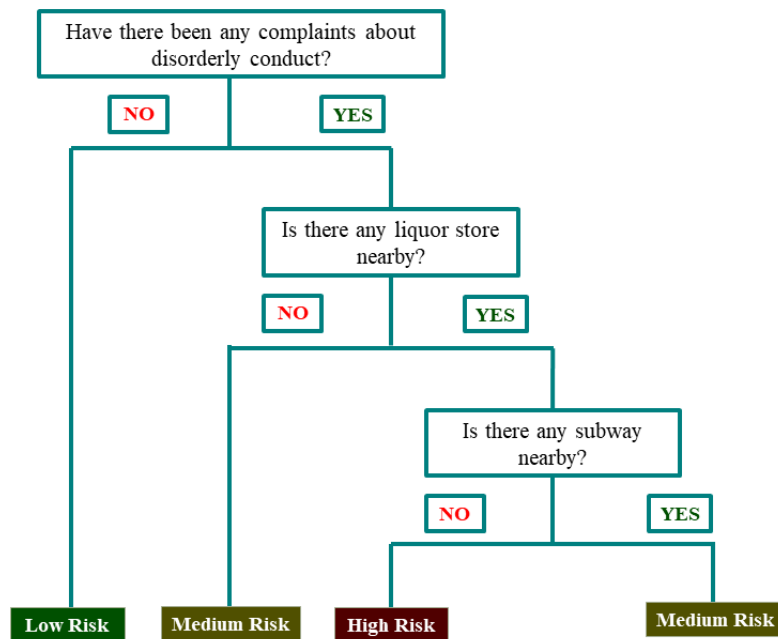
Basic Structure of Hunchlab, which works on a tree based mechanism for predictive policing

cies to tailor interventions and allocate resources in a more targeted manner. Different statistical analysis is conducted to identify the relationship between these environmental factors and crime events. From these, risk maps are created that highlight area with high risk. The idea of considering environmental factors in the occurrence of crime can be dated back to the article written by Dr. Joel Caplan and Dr. Leslie W Kennedy. This model is adopted by police departments in Philadelphia, New York, Dutch, and London.

HunchLab represents a significant advancement beyond the Risk Terrain Model, incorporating a sophisticated tree-based model that assigns risk levels to each grid cell. This cutting-edge approach greatly enhances the accuracy and precision of risk assessment, enabling more effective prediction and analysis

Catching the Future:
The Prospects and Pitfalls

Indeed, like any technology or approach, predictive policing comes with its own set of drawbacks and challenges. The very first one starts with the data itself. Predictive policing algorithms function best under ideal conditions of fair and unbiased data. Unfortunately, this is not always the case in the real world. For example, the Chicago Police Department (CPD) has a history of corrupted and biased data against marginalized communities.

Utilizing such biased data can result in algorithms that perpetuate biases and exacerbate existing issues, worsening the situation instead of improving it. It is essential to address existing biases within law enforcement before implementing predictive policing technologies, as the accessibility of transformative technologies like machine learning and artificial intelligence can reshape the landscape of law and order. Lack of transparency is another major issue observed in law enforcement practices and the development of predictive algorithm-based software. This hinders public scrutiny of data usage and procedures, as the inner workings of these algorithms are often undisclosed to the public.

For instance, the Los Angeles Police Department's LASER program, a prediction algorithm-based system, was discontinued in 2019 due to an internal audit report revealing irregularities within the program.

Similarly, the Chicago Police Department had to abandon its predictive software-based program due to severe criticism.

All these shortcomings raise a fundamental question: Can predictive policing techniques be effectively adopted in India? Will their implementation help enhance the law enforcement system, or will it result in an undue concentration of power in the hands of the state, potentially leading to further challenges and unrest?

Data-driven policing programs can reinforce harmful patterns, fueling the over-policing of Black and brown communities

The Indian Context

AI applications have entered the Indian Police force relatively recently (since 2019), but they have already made significant strides. For example, the Crime Mapping Analytics and Predictive System of Delhi collects data from ISRO's satellites every three minutes and uses the Dial 100 helpline to identify crime hotspots. The Hyderabad Police Department has started using person-based predictive analytics algorithms, utilizing data from the Integrated People Information Hub, which includes sensitive details like biometrics, bank information, passport details, and Aadhar card information.

Considering the continuous threats from internal and external forces and the existing issue of underfunding, there is a necessity for the Indian police force to incorporate predictive algorithm techniques into their daily operations. However, it is crucial to exercise caution before implementing large-scale machine learning-based algorithms.

Challenges such as under-reporting of crime in cer-tain states like Uttar Pradesh and Bihar can lead to the generation of flawed data. There is also the potential for bias against minority and underprivileged sections of society, given that a significant portion of the existing undertrials belongs to these communities. Transparency concerns arise, particularly when sensitive information like fingerprints and retinas are utilized.

It is important to note that merely enhancing the efficiency of the policing system does not provide a comprehensive solution. It can create bottlenecks in other areas, such as the judiciary, and unbalanced power dynamics within the three pillars of democracy.

Therefore, while considering the adoption of predictive policing techniques in India, careful evaluation and appropriate safeguards must be implemented to address these concerns effectively. It is crucial to strike a balance between enhancing law enforcement capabilities and preserving the democratic principles and rights of individuals.

"Surveillance is a necessary evil in the face of evolving threats, but it must always be accompanied by strong oversight and safeguards to protect individual liberties"
- Edward Snowden

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Conclusion

The adoption of AI and ML in law enforcement has the potential to enhance efficiency, optimize resource allocation, and aid in crime prevention. However, it is crucial to address the challenges associated with biased data, transparency, and the potential exacerbation of existing issues within law enforcement. Implementing these technologies should be accompanied by strong oversight, safeguards, and efforts to promote fairness and protect individual liberties. By prioritizing ethical considerations and continually refining AI algorithms, we can harness the full potential of these technologies while upholding principles of justice, equality, and accountability in our pursuit of safer communities. As depicted in the image, the right balance between data privacy, and public safety should be drawn.