

## Eliminating Bias in Predictive Policing tools for increasing Degree of Justice

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**Abstract**— This paper acts as a readymade guide to essentials of predictive policing and how the tools deployed in prediction of crimes using AI may suffer from dimensional bias. Our paper is a sincere attempt to bring out the inherent loopholes in the predictive policing technologies and how to overcome them. This paper brings out the principles and practices involved in predictive policing and how the states in India are using AI to strength their police departments so as to reduce crime rate in their area of control. The paper also explores the common pitfalls while employing the predictive policing techniques and some of the existing myths related to predictive policing. We also include few case studies in the results section which gives the reader a view of the current state-of-art in predictive policing.

**Keywords**—Prediction, Policing, Crime, AI, Justice

### I. INTRODUCTION

Artificial Intelligence (AI) has shown huge loads of guarantee inside the last many years yet with the new resurgence of interest and further developed outcomes on certifiable errands the area is going through unpredictable development[1]. In this field, progresses in AI neighborly additional opportunities and difficulties for instructing and learning in training , with the possibility to essentially change administration and thusly the interior design. AI technology is employed for surveillance, to watch the gang for an anomaly, evaluate video footage for crime and apply face recognition to optimum effect. AI in policing is predicted to cause changes in security and assurance to a society. AI is quickly emerging as a key technology for public safety agencies seeking to create safer, smarter communities[2]. AI and machine learning (ML) can help fill operational blind spots with assistive insights, helping avoid impacts from large, rapid on-set incidents and since those insights are supported a company's data, it promotes confident decision-makings.

Predictive policing, considerably, is taking information from dissimilar sources, examining them and afterward utilizing results to expect, forestall what's more, react all the more successfully to future wrongdoing[3]. Predictive policing involves becoming less receptive. The predictive vision moves law requirement from zeroing in on what happened to zeroing in on what will occur and how to successfully convey assets before wrongdoing, in this manner evolving results. It is important for security-related capacities like reconnaissance and following, and is a urgent guide to the police in its analytical job, for example, in legal sciences. The appropriation of arising innovative devices can likewise have expansive results on police conduct; in the control practiced over the general population, common freedoms and police responsibility[4]. As the police's job advances past keeping law and control; especially during a worldwide wellbeing emergency.

Present day Policing is TRANSPARENT AND ACCOUNTABLE; that is, without thinking twice about undertaking tests, police are to be freely open in their activities, their strategies, practices, order, and preparing

techniques — and when and how regularly they use power. Data Mapping Crime, Smartphone Tracking, Social Media, Wi-Fi Capabilities, Biometrics, and smart sensors can be utilized to assemble a wide range of kinds of data to assist officials with tackling their responsibilities quicker and all the more viably. New abilities can log areas, tune in for discharges, transfer video, banner tags, examine data sets, and go on virtual watch, permitting officials phenomenal mindfulness in their surroundings.

## II. RELATED WORK

### 1. Principles involved in Predictive Policing Processes and Practices

Forecast drove policing has multiple benefits; rather, it is a far reaching business measure, of which insightful policing is a part. That cooperation is summarized in Figure 1, which is around established on the middle for Predictive Policing's SARA (Scanning, Analysis, Response, and Assessment) model[5]. The initial two stages are gathering and examining wrongdoing, episode, and wrongdoer information to deliver predictions. Information from unique sources locally requires some type of information combination. Endeavors to consolidate these information are frequently a long way from simple, in any case. The last two stages centre on the reaction to the predictions. Police department utilize the predictions to educate their reactions and afterward react utilizing proof based methodologies. Hoodlums respond to the modified environment. Some will be taken out from the environment the individuals who are as yet indulging themselves in criminal activities will positively change their ethics or move to an alternate region.

#### Data collection

All predictive policing methods rely upon information. Incidentally, besides the volume, the nature of these information will decide the handiness of any methodology. The truism "trash in, garbage out" emphatically applies to these investigations. Endeavors ought to be made to guarantee that information are precise and complete, however a few methods are less delicate to little blunders than others. Informational indexes should be refreshed intermittently to guarantee that they are mutt lease and mirror the impacts of intercessions[6]. All around prepared experts and scientists are likewise basic to predictive policing: Even with flawless information, an absence of solid

examination may result in under beneficial results. As a feature of the information assortment and examination measure, experts should have the option to join unique information sources. There are various strategies for

consolidating data, going from straightforward procedures that offer an inexact picture (some of the time alluded to as heuristic answers for) more modern techniques that empower data combination. By and large, we discovered little proof that offices have created formal principles for joining information from dissimilar sources to shape strong image of high-hazard spots, people, and gatherings.

#### Analysis

Utilizing efficient data mining and the popular regression techniques to investigate accessible data sets can give bits of knowledge into wrongdoing designs that are novel to a



Figure 1. Predictive Policing Business Process

given locale. The patterns recognized in this exploratory investigation would then be able to illuminate the plan regarding a strategy to distinguish problem areas. For instance, these strategies can disclose to you how far back to search for wrongdoing examples or regardless of whether there are occasional or week after week drifts that ought to be remembered for the examination. GIS data mining can likewise be educated by regressions and can be utilized to investigate data[7]: Geographic profiles got from bunching methods can uncover pat-terns demonstrating a sequential crook.

#### Police practices

Indeed, even the best investigation will never really influence crime percentages on the off chance that it doesn't impact police rehearses. Areas recognized as problem areas may require extra watch attention, intermittent visits by beat officials, or different reactions that are suitable for the sorts of violations happening there [8]. Successful mediation should likewise happen in corresponding to a continuous evaluation measure: To what degree has a police division's reaction decreased wrongdoing? A forceful, target evaluation measure is vital to working on this reaction. The kind of mediation will fluctuate with the circumstance and the division accused of interceding. Figure 2 shows three expansive kinds of intercessions, organized (start to finish) from easiest to generally mind boggling. As a rule, we guess that the more muddled mediations will require more assets,

yet they will be better custom fitted to the genuine wrongdoing issues—and improve results.

- Generic intercessions: allotting more assets because of expanded danger. For problem areas, this may mean allotting more officials; for "hot individuals," this may mean dispensing more parole or post trial supervisor contacts.
- Crime-explicit intercessions: doling out assets that are customized to battling the normal kinds of wrongdoing. Assets and mediations may zero in on a given problem area or a specific individual who is in danger of culpable.
- Problem-explicit mediations: distinguishing area , populace , or individual explicit issues producing wrongdoing hazard and fixing them. This level incorporates measures to examine and address explicit violations, nearly by definition.

### Criminal response

When the police dispatch an intercession, a few criminals might be captured and taken out from the roads. Others may decide to quit carrying out violations, change where they perpetrate wrongdoings, or change the manner in which they approach perpetrating wrongdoing in response to the police intercession. Hence, an area that had been hot can chill, with some criminal action moving to another space[9]. These progressions will make the first informational collection old. Along these lines, the cycle starts again with another round of information assortment, investigation, and intercession.

Intervention Methods

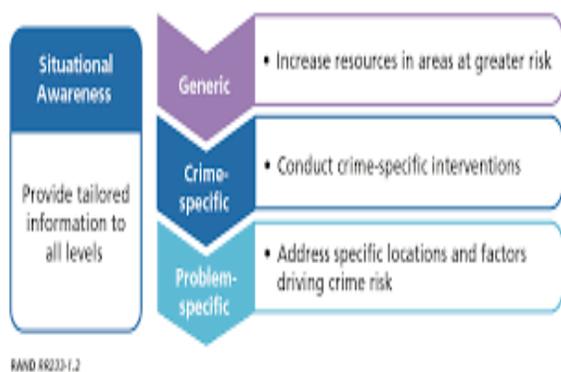


Figure 2. Intervention methods

### III. METHODOLOGY

#### Pitfall 1: Appreciating Prediction Accuracy and undermining Tactical Utility

Assume an expert has been approached to give expectations of burglaries that are as "precise" as could really be expected. Here, "precise" implies that the investigator plans an examination where whatever number future violations as could reasonably be expected fall inside regions anticipated to be high-hazard, in this way con-firming that these regions are high-hazard. To get a model from RAND investigation into counterinsurgency activities in Iraq, a PC model predicted that an IED occasion would happen some place in the city of Mosul in the following 48 hours[10]. That was without a doubt precise; however it was scarcely of any strategic worth. When performing strategic investigation, specialists ought to for the most part center on creating results with strategic utility. This implies that the size of the analysis should fit the size of the potential reactions. For instance, a beat official can probably deal with a couple of problem areas the size of a city block yet would not think that it is reasonable to zero in on a strip a couple of miles long.

#### Pitfall 2: Depending on indigent-Quality Data

On the off chance that information is overlooked, as in it will create the impression that there is no wrongdoing in explicit regions. This is the essential motivation behind why it is so significant for police divisions to comprehend the ground truth in playing out these investigations; office experts can spot issues in the yield that would prompt these sorts of efficient mistakes. An investigation in excess of 400,000 wrongdoing occurrences from six huge law implementation purviews in the United States tracked down that positional precision of geocoded wrongdoing occasions is a huge factor in prescient wrongdoing planning. Relevance is likewise a significant issue with information quality. For some wrongdoing groups, it very well may be extremely valuable to have information returning numerous months or a long time. For instance, if muggers as often as possible objective bar-participants after last call, information from a while will be helpful in distinguishing key problem areas. Then again, if there is a binge of very much like looter is probably carried out by similar crook, a while of information won't be very useful in light of the fact that the information would catch both the dynamic criminal's thefts and old cases, making designs more earnestly to discover. In the principal case, the essential shared characteristic between the information focuses is the

objective, so it might bode well to incorporate violations returning beyond what many would consider possible to assemble problem areas. In the subsequent case, the shared trait is the conceivable culprit, and the informational index utilized for examination should zero in on their wrongdoings as it were.

### **Pitfall 3: Delusion regarding the causes behind the Prediction**

While applying methods, for example, relapse or any of the information mining variations, utilizing sound judgment to vet the elements joined into the model will assist with keeping away from deceptive connections. Have an anomaly about the drivers of forecasts with the goal that more profound connections can be found. This is of uncommon concern when utilizing information mining strategies on huge quantities of possible info factors: Just on the ground that the strategy places a variable into a model to predict wrongdoing doesn't imply that that variable causes wrongdoing. Then again, in light of the fact that a variable doesn't appear in a specific model doesn't imply that the variable is definitely not a significant driver. This trap is firmly connected to the initial two legends. The human component of the investigation is key on the grounds that lone a prepare wrongdoing examiner can give the suitable setting to survey the utility of the PC's yield. PCs may arrive at last, yet they can't play out these appraisals yet.

### **Pitfall 4: Neglecting impact of Assessment and Evaluation**

During our meetings with specialists, not very many said that they had assessed the adequacy of the expectations they created or the mediations that followed the forecast. As a feature of refreshing the information to keep them current, survey the adequacy of investigations and resulting intercessions. Notwithstanding how well a police system works, some perspective can quite often be improved. Estimation is vital to distinguishing regions for development, deciding the adequacy of mediations, and settling on choices about how assets are distributed. To evaluate the viability of wrongdoing examination suggestions, follow-up information on both the wrongdoing events and police reactions should be gathered. The predictive models can be tried on these results over the long haul with the agreement that police reactions to the forecasts may affect the results. Appraisal and assessment are likewise important to confirm claims about programming and procedures. A merchant may guarantee that, following the reception of its product, wrongdoing in a city fell by x

percent. Due to more extensive patterns in wrongdoing, this assertion might have been genuine regardless of whether the city had not utilized the product. Without proper endeavors to survey these instruments, any case of viability ought to be taken with a sound portion of doubt.

### **Pitfall 5: Overlooking the aspect related to Privacy Rights**

The actual demonstration of marking regions and individuals as deserving of additional law authorization consideration innately raises worries about common freedoms and protection rights. Naming regions as "in danger" seems to present fewer issues in light of the fact that, all things considered, people are not being straightforwardly designated. The U.S. High Court has decided that principles for what comprises sensible doubt are loose in "horror regions" (e.g., problem areas). Utilising predictive policing procedures to distinguish problem areas raises not many security issues on the grounds that the information regularly don't contain expressly recognizing information. Transparency about the sorts of data gathered and the employments of that data may additionally assist with easing fears of intrusion of protection. The normal response to date has been that, in light of the fact that most high-hazard people are now under restorative oversight of some structure (or are essentially indicted criminals), law implementation generally has unlimited authority to make sensible analytical and prudent moves against them. Once more, what "sensible" involves, and under what conditions, is a long way from clear. This is a region that we accept warrants considerable further innovative work throughout the next few years.

## **IV Risk Mitigation by fixing AI Loopholes**

To eliminate the inherent risks associated with usage of AI technology, we propose a framework where the algorithmic biases are reduced to a great extent.

Below are the framework components:

1. Incident data coupled with intelligence data
2. Rule generation engine
3. Prediction report
4. Analytical Dashboard
5. Dispatch system

In below section, we discuss regarding the above components

### **1. Incident data coupled with intelligence data:**

Data related to previous crimes and any other relevant information is aggregated with data obtained from the

intelligence units of the police community and a dataset is prepared by refining irrelevant factors.

**2 .Rule generation engine:**

The main aim of rule generation engine is to find predictive patterns and trends in the databases. Association rules indicate statistical relations among one or more items in the dataset. For example in the predictive policing tool, associations represent the relations between the crimes that are committed together. For instance if we observe that in 70% of the cases when criminals commit a theft they also injure a victim.

**3. Prediction report:**

This component classifies the different crimes in categories modeled as a multi-class classification problem. Here a meaningful mechanism is to group the crime categories into fewer, larger groups, in order to find structure in the data. We can get easily high accuracy and precision on Prediction. But, the Violent/Non-violent crime classification cannot produce significant results with the same classifiers. Hence effort will be needed to select the options with high degree of carefulness.

**4. Analytical Dashboard:**

This component of our framework contains possible outlets with time-series modeling of the data to understand temporal correlations in it, which can in turn be used to predict leap in different categories of crime. It would likewise be intriguing to investigate connections between floods in various classes of crimes – for instance, reality could eventually show that at least two classes of crimes flood and sink together, which would be a fascinating relationship to unearth.

**5. Dispatch system:**

This component of the proposed framework will pass quick messages to the nearest police stations and patrolling units where crime hotspots are identified. This should be a regular practice to monitor the dashboards and keep alerting all the policing units on the field.

**V. Results and Discussion**

Sl. No.	Indian State with Predictive Policing Process	Current state of work	Impact of Proposed Framework
1	Jharkand Polics	A data mining software is being developed to scan online criminal records	Predicting inherent demograp hics of criminals and storing their records

Sl. No.	Indian State with Predictive Policing Process	Current state of work	Impact of Proposed Framework
2	Hyderabad Police	This hi-tech surveillance system includes facilities such as IP based outdoor security surveillance cameras, automatic number plate recognition system(A NPR), video analytics, mobile surveillance system, command and control center and data center, etc.	With the help of our proposed framework field operation teams will get sufficient information to stop maximum possible crimes in their operationa l domain.
3	Delhi Police	CMAPS( Crime Mapping Analytics and Predictive System)li nked with 100 helpline Data can identify and visualize crime hotspots	The Analytical Dashboard will help measure the severity of the crimes area wise and help the response team in 24 x 7 mode.
4	Maharashtra Police	As a piece of cyber security moderniza tion program, the Maharashtra governme nt is attemptin g to overhaul its advanced innovatio n based strategy to incorporat e	With the proposed framewor k, the police departmen t can analyse the social media data in real-time basis to spot people who are attemptin g to spread hate among the

Sl. No.	Indian State with Predictive Policing Process	Current state of work	Impact of Proposed Framework
		"predictive policing strategy".	different sections of society.

## VI. Conclusion

Predictive policing can be a game-changing innovation, bearing the cost of law requirement the chance to switch things around on wrongdoing without precedent for history. In any case, if the information that drives this innovation is one-sided, the dangers will best any advantages. It is still a lot of early days concerning predictive policing, however it is progressively significant for law requirement to resolve issues like this and guarantee that its utilization of predictive policing is reasonable, responsible, straightforward and logical. In addition, those that will be influenced by such instruments ought to be given a say in their turn of events and organization. As a local area would ostensibly will in general support security over interests like privacy, law authorization is the edge case concerning the moral utilization of AI. In the event that law requirement can take initiative on the moral utilization of AI instruments, for example, predictive policing, and different networks will follow.

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