Crime Prediction and Reporting System

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Abstract - *The increasing rate in criminal activities is a growing concern for any particular country/region. The intention of the proposed system is to develop a web application which is user-friendly to the stake-holders such as invigilators, NGOs and end-users. The system establishes a simple relation between the above-mentioned stake-holders where any individual user can report a crime without himself going to the police station. The invigilator's then can track the complaint and give an option to the NGO for Rehab. Also this system analyzes crime data of India scrapped through various websites. The main focus is to predict the crime which is most likely to occur in the near future using various Machine Learning models.*

***Key Words*: Criminal activities, Invigilators, NGOs, Police station, Analyze crime data**

1. INTRODUCTION

The vast expanding technology in the face of Artificial Intelligence and Machine Learning has seen exponential growth over the last decade. This growing change contributes to help humankind in numerous fields pertaining entertainment, money or finance, e-platforms and many more. Thus, there comes a bigger picture or issue which needs to be addressed using such extraordinary technologies which is Crime. Overpopulated countries like India have to withstand a lot of issues regarding the rate at which the crimes are increasing. The digitalization age brings us a good number of opportunities to look into this matter and try to eradicate it with these increasing IT advancements. The system is proposed with a view to accommodate all the relevant bodies which are concerned with crime in a single system. Technically speaking, the people involved in a particular crime solving are usually the Invigilators or the officials, a Non- Government Organization (NGO), and a person who has reported the crime. Thus, the system has to be planned in such a way that an end-user like us or a normal citizen can log-in and report a crime based on various filters used like location and type of crime. Also, the user has to provide the basic authentication details required for a false/ fake complaint. Generally, there is a basic conception that a child worker is seen working on a tea-stall where people visit daily and they don't do much rather experience it and carry on with the schedule. People find it a bit mainstream to officially lodge a complaint for this tier of crime. The system makes it a matter of minutes to take such hideous acts in the view of Invigilators and ultimately helping the young lad, thus providing free education by various NGOs associated with our system.

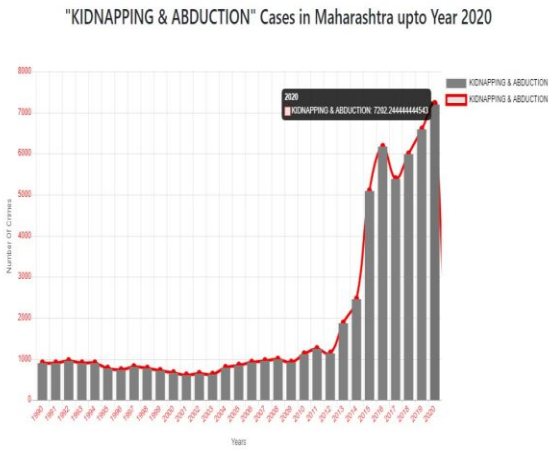

Fig. 1 Prediction Graph

Also, other stakeholders like Invigilators, local authorities and NGOs get various insights from the unstructured data without any significant meaning. Crime visualizations using traditional Machine Learning models provide us with various patterns in the crime data structured according to the need of the user. Technically, the visualizations can be obtained according to state-wise plots or date-wise plots. The prediction system comes in the play when we want to emphasize the significant problem. The system tries to predict the hotspots of crime i.e., signaling out the regions across all India where the next wave of surge is to be seen. Also, the crime rate of future years can be obtained at a particular % of accuracy, thus gaining a similar insight based on the number.

The main idea behind the project is to ease the policing and NGO work by bringing Machine Learning and AI into the picture by elaborating the crime patterns and rate which could be seen in the near future and also predicting the hotspots where the next wave is likely to occur. Thus, easing the process of patrolling and concentrating on such localities with more intent. The basic inspiration is that no existing systems perform on the strategy of bringing these stakeholders under a platform and solve the issue using the wonderful field of Data Science. Therefore, the project benefits the Public sector, Government sector as well as the Private Sector.

The system uses the dataset provided by National Crime Records Bureau which is the official organization designed for crime datasets in India with a view of empowering Indian Police with Information Technology. Thus, the data provides the stats for various crime types from 1990 to 2018. The data is scrapped using web-scraping libraries of Python like BeautifulSoup, etc. The data scrapped contains redundant data, null values. Thus, data pre-processing is implemented on the obtained dataset in order to clean the data and replace null values using Pandas, Numpy, and other Python Libraries. The most significant aspect of the project is choosing a Machine Learning Algorithm that best fits the dataset and provides maximum accuracy. Thus, the optimum algorithm provides the prediction which is represented using simple visualization charts and plots. The data integrity and security is maintained throughout the process. The system uses technical platforms like tableau, flask, php, etc. The visualizations and charts are shown using a couple of javascript libraries like plot.js and chart.js. The detailing and choosing of the most optimum machine learning algorithm is covered briefly further in this chapter.

The major applications of the system can be providing patterns from the large number of crime data stored under local authorities of India. Also, Researchers can come and find various insights required for their work in crime related fields. Anyone registered on the platform can view the visualization and dashboards of its choice. This can also help in deploying a capable officer of high tier in a region where the surge is obtained. Thus, easing or preventing the crime even before it takes place or reducing its strength. The Non-Government Organizations which are associated with the system can increase their rehab rates by focusing in such regions. Also, the crime where Child labor and domestic violence is involved can be taken into consideration by NGO bodies which function for such victims. To make it even more efficient, the system tries to provide a separate domain in Cyber security for Domestic Violence where the basic idea is to make people aware of the foreseen threats and prevention measures. Also, what to do when one is caught in the trap of cybercrime, various threat scenarios and defense strategies protecting the passwords, secure web, etc. Such functionalities make an attempt to contribute in the field of cyber security. The prediction system accepts “Year”, “Crime Type” and “State (region)” as the inputs and outputs of the crime rate prediction up to the input year, using state-based aggregated comparison using various visualization techniques like chart and plots. The visualization system consists of three main factors namely- State Comparison for Crime against women, State Comparison for Crime against children and State Comparison for Crime against Indian Penal Code (IPC). The data available is limited, thus as the data increases further the system tries to improve its accuracy and persistence.

2. Comparative Analysis

Crime is one of the biggest and dominating problems in our society and its prevention is an important task.

Daily there are huge numbers of crimes committed frequently which need to be brought under control. Police analysts are required to solve the complexities in raw data to guide concerned authorities in arresting offenders and implementing crime prevention strategies. However, a huge number of crimes are being committed and the awareness of modern criminals make it a difficult task. The ability to analyze this amount of data with its inherent complexities without using computational support puts a strain on human resources.

The Proposed system scales to the scope of benefiting the following sectors:

Government: The lack of systems or patterns to understand the severity of crime threat and its different states/districts/regions of the country.

Police: The lack of structured data available to the officials makes it difficult to detect criminal activities.

Public: No such system exists where a normal citizen can opt for real estate in future based on the crime rate in that particular area at that time

NGO: lack of reporting of minor cases like child labour, domestic violence, etc makes it difficult for the NGO’s of such type to perform effectively

Crime prediction, prevention and detection with data mining is an exciting new area, which brings together the disciplines of statistics, machine learning, artificial intelligence, criminology, psychology and database technology.

	Traditional Approach	**Proposed System**
Reporting System	Reporting a case of minor crime like child labour, domestic violence, etc person can call a helpline number or directly report to police station	The proposed system allows the user to bring such types of crimes in the eyes of respected authorities by just logging onto the system.

Bringing Crime related parties together	After a Crime is reported or previous backlog crimes are usually assigned to specific teams of officials.	All the parties related to crime like Invigilators, NGOs, Citizens are brought together under one system
Visualization of Crime data	All the crime related data is stored in unstructured format with lots of errors and missing values.	The unstructured data is visualized using plots and graphs and stored systematically. Thus it can be helpful for Invigilators, NGO's , Researchers, etc
Efficiency of NGO	The NGOs find it difficult to get exact information about the crime and thus it is difficult to develop its rehab models	Due to ease in reporting a Crime and readily available data, NGOs can efficiently develop the Rehab models

2. The Proposed System

The above system is proposed in such a way that it should accommodate all the relevant bodies which are associated with crime. The system includes access for end users like normal citizens, Non-Government Organizations and Invigilators of the Crime department or the official authorities in this field. The above stakeholders of the system need to register or sign up on the web portal in order to access the system. The user credentials are stored on the databases where entities for User, NGO and Invigilators are separated. Other Databases consist of tables that store NGO details, Invigilator details and User details all simultaneously managed by Admin. The User page is a friendly interface to register and report a crime or complaint based on several filters like crime type, region, etc. Also, users can have access to visualizations and prediction systems where a User can check about the crime hotspots or a likely surge in a specific region. Thus, making him/her alert to the possibility and ultimately creating a sense of awareness.

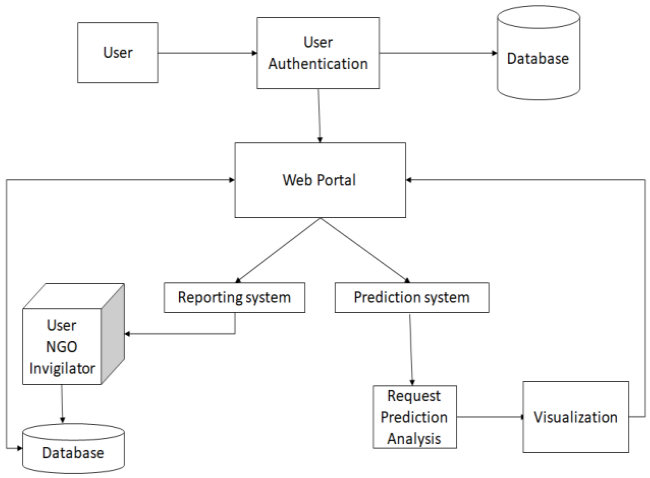

Fig.2 System Architecture

A researcher can also try and obtain insights from the visualizations and predictions which can help in the work of cyber security or crime. The user's complaint gets shown up on Invigilator's interface and hence the location of the crime is popped with a marker on the map portal which is available for Invigilators. After rescuing a victim of a crime that is of the NGO relevant caliber, the NGO database gets updated for a rehab mission. Thus, a child labor victim or Domestic violence victim can be rescued by Invigilators and now can be sent for rehab through registered NGOs. Therefore, as the system grows more and more Invigilators can be logged into the system to contribute in the process of eradication of crime. Also, large numbers of relevant NGOs can apply themselves to the system ultimately helping the victims to not fall prey to such malpractices again and thus carry out a successful rehab program. The next part of the system architecture comprises mainly two parts i.e. Predictions and Visualizations. The major types of crime that occurred against women are classed as a single crime named Crime against Women. Similarly, the other three significant classes of crimes are Crimes against Children, IPC Crimes based on population and SLL Crimes. Any crime class needs parameters such as "Select year", "Select Crime Type" and "Select State" as inputs to get predictions according to the data as outputs. The outputs are mainly graphs and other analytical factors. Thus, the visualization part mainly consists of Comparisons and insights of various crimes according to the state. The significant factors considered for analytics are the crime rates per one lakh people and literacy rates of Indian states. Thus, this is practiced with such a view that the crime rates can be depicted based on the population and also the literacy of that region. Thus, population and literacy can be considered the major factors which affect the crime rate of a state. A certain value is set as a threshold for prediction purpose as not all standard algorithms are suitable for this predictions.

3. CONCLUSION

The outcomes and results of the above research approach will be to design a central system with a dedicated view and purpose i.e. Eradication of crime in India. Thus, the system will try to throw some analytics related to crime in the eye of the officials and related bodies. The patterns and insights which are not seen through the raw data stored in crime databases is made now made more clearer and hence it ultimately helps in solving the crime at a quicker rate. The results can be displayed using various visualization techniques and they are showed as the relation between two or multiple factors like Crime type and state, etc. It has been observed that the crime rate goes on adding numbers year by year in a populous country like India. Thus, there is an immediate need to take possession over this increasing malpractices by introducing Intelligence and Machine Learning technologies, which are the most trending fields in IT industry right now. Hence, with the growing concern of Cyber Crimes emerging in addition to other types of crimes, the system also contains a dedicated guidelines to help citizens not get trapped or fall pray. The aim was to transform people into Cyber Secure Users. Although, there have been numerous existing systems working in this matter but this system stands apart due to its principle of bringing all the stake holder relevant to crime together at a single platform.

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