

Smart City Crime Analysis and Surveillance

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Abstract:

For a smart city, controlling crime is a major concern. Crime data is increasing. They are reducing day by day crime and police rates within big cities like New York have set examples of how they are reducing the crime rate with help of crime data. With the advancements in the technology, we are stepping forward to the future of Smart Cities. But still we have a large number of hurdles to achieve that vision. One such problem faced by our society is the large number of crimes happening across cities. The problem here is in collecting good crime data specifically for a particular area so that our data analysis techniques draw some good analysis specifically for our smart city. After that we need to strategize solutions as per the specific patterns in crime data.

Keywords —surveillance, smart city, crime, data analysis.

I. INTRODUCTION

Data is very crucial aspect in determining the results and impact of an action on a large portion of society, nationally and globally, in unison or individualism. Data analysis is an emerging technology focused on grasping vital patterns or trends/insights to solve many real life problems, to enhance sales in terms of marketing and product. Data Analysis is performed as we are working on cloud based technologies which together form a complex database overloaded with raw data to make conclusions is vital in terms of solving a problem as crucial as crime, all around the globe. Many studies emphasize on this aspect of data analysis, there are plenty of existing studies and

approaches which have been and are used for effective analysis.

The empirical method of interpreting the particular characteristics of a crime and associated crime scenes is the study of the crime scene (crime analysis). It requires an integrated evaluation of the features of forensic evidence, forensic and the crime scene. The records management system of the department does not meet the needs of prompt, complete crime investigation in certain cases. To address this need specialized databases can be developed. These may be continuous or case-specific.

The public safety community, particularly in crime analysis and operations, is one field which has been very restricted in its adoption and use of these powerful new techniques. This is somewhat

surprising, since many of the concepts of data analysis or information discovery are expressed in many respects by researchers, investigators, officers, intelligence service staff, and other operational personnel. Video monitoring allows movement, behavioural trends or any other shift in environmental conditions to be tracked. This involves remote monitoring via electronic equipment (such as CCTV cameras). Video monitoring can be carried out in real time or when necessary, data can be collected and stored for evaluation purposes. The storage, video management, and analytics solutions are centrally hosted in a cloud environment in the video surveillance-as-a-service (VSaaS) delivery model and are accessed over the Internet.

In order to increase the efficiency and sustainability of urban spaces, while reducing costs and use of energy, smart cities aim to incorporate information and communication technologies (ICT). Smart cities track people in the sense of surveillance by strategically positioned sensors across the urban landscape that collect data on several different factors of urban living. In order to enhance efficient law enforcement, optimise transit networks, and improve critical infrastructure structures, smart city technology has developed practical applications, including delivering local government services through e-Governance platforms.

Along with crime analysis and safety, a citizen's trust and assurance is of vital importance. For this, we also built an online FIR system which is embedded into our website, allowing citizens to file quick and easy FIRs without any hustle and waiting in lines at police stations. This allows the citizens to be able to file valid FIRs which in turn helps increase the validity of crimes in a particular area. It too allow us to regularly update our crime data hence building awareness to people in a particular area of the latest and the types of crime occurring so that citizens can be mentally prepared for the same.

II. PROBLEM

For a smart city, controlling crime is a major concern. Crime data is increasing. They are reducing day by day crime and police rates within big cities like New York have set examples of how they are reducing the crime rate with help of crime data. The problem here is in collecting good crime data specifically for a particular area so that our data analysis techniques draw some good analysis specifically for our smart city. After that, we need to strategize solutions as per the specific patterns in crime data.

Problem formulation came into picture after analysing the current and ever growing crime rates and despite certain measures, it is still on a hike. Formulating the problem mainly involved the spread of hoax/ fake news like wildfire through social and digital media, leading to unknown and uncertain fear and chaos in society. Unmeasurable crime hikes, and with unattended FIRs, based on the analysis of data where the amount of registered FIRs was way more than the cases resolved for various types of crimes, leading us to conclude to think and build a powerful and effective solution for it. The amount of crime that is being committed and the intelligence of modern criminals, however, make this a challenging job. The ability to analyse this volume of knowledge without its underlying ambiguity. It puts a strain on human resources through the use of computer support.

The commotion and unresolved cases are ever increasing according to the analysis we made, and thus leading us to cater to the user's needs and other attributes. If we narrow all this to one, our objective is focused on a 'Smart and safe city'. Knowledge accuracy, with both printed and digital media, has been a long-standing problem impacting companies and society. The scope and consequences of information shared on social networks occur at such a rapid pace and so amplified that skewed, misleading or false information acquires a vast capacity for millions of users to cause real world impacts within minutes. Recently, many public concerns about this issue and several solutions to address the issue have been expressed.

Consumers generate and share more information than ever before with the current use of social media sites, some of which are deceptive with little relation to reality. Automated classification of a text article as misinformation or disinformation is a difficult job.

In order to provide citizens an easy and feasible way to know whether a news is fake or not, we used web scraping methodologies to classify a new as fake or true, also one of the feature of website. In the input news post, it scrapes several news websites and tests for keywords and calculates a percentage that incorporates the effects of the machine learning approach that uses the logistic regression algorithm and the web scraping tool. Often the feeling or the sentiment behind the news article is a big factor to weigh in terms of false news, the news article may be biased towards a particular political propaganda, therefore in favour of a hand.

True news, however, must be impartial; it must be truthful, not accusing or declarative. The proposed method therefore conducts sentimental analysis involving pre-processing, NLTK lemmatization, porter stemmer and uses the naive Bayesian algorithm to notify the user about the bias in the news article, and then provides the user with the emotion behind the news article. The above two approaches will provide the user with two outputs: the percentage of how accurate the news article incorporates the results of the logistic regression algorithm and the web scraping approach and through sentiment analysis will output the sentiment behind the content. This will make it easier for the user to make an educated decision about the essence of the user's news post.

Our project relies on current crime data, feedback of users, types of crimes more likely to occur in a particular city, and last but not the least, to be able to identify spam news, messages and other social media links.

1) Centralized system for FIR registration for citizens.

2) An automatic surveillance system that can detect crimes and search for criminals.

3) Protection from spam Messages, Images, YouTube Videos, News, Websites.

4) Automatic emergency detection for citizens and bringing help faster.

5) Strategic management of police with the help of city crime data analysis.

III. FEASIBILITY ANALYSIS

Our project is focused narrowly on the crime data from city Aurangabad in Maharashtra, the data set is self-made which involves FIRs registered, various IPCs involved, and the frequency analysis to conclude the crimes which occur frequently as compared to other crimes. This helps us to narrow down our focus to major crimes and then build strategic plans to combat those at first.

Crime data analysis is feasible using statistical tools as R, Tableau etc. Fake news/hoax detection is a researched topic which is feasible through concept if deep learning, using various deep learning models such as LSTM and our all-time favourite ANN (Artificial Neural Network).

With help of fake news detection we can provide end users the satisfaction of confirming an input link of URL or keywords which our model will detect with best of the accuracy to ensure citizens of the news they are carrying with themselves.

IV. RELATED WORK

There are plenty of existing studies and approaches which have been and are used for effective analysis. Our problem statement focuses on crime data, which consist of raw data in the form of FIRs registered under various IPCs (Indian Penal Code).

Existing studies suggest, statistical approach has the most effective one. Since statistics involve high level mathematics to predict, patterns and trends by involving comparison charts, pie charts etc. and it works best when we have a complex data as of crime, which involves many binding factors such as what all IPCs are involved under a FIR, along with,

cases against women, children along with type of crimes involved, theft, dowry, domestic violence and so on. Correlation, regression are among two strong statistical approaches used for such analysis, which we have incorporated while performing analysis on our self-made dataset.

Another approach involves expert knowledge. It involves the physical real time analysis of crime scene areas, such as DNA fingerprint testing, other forensics combined with data mining techniques which is quite an advanced approach.

Lastly, deep learning and machine learning, which are epitome of prediction and creating model for overall prediction of patterns and trends and mostly in identifying a news as fake or true through fake news classification using deep learning techniques as it is indispensable for society to be aware of the thin line between a true and fake news and other hoax which always tend to roam around us.

In proposal paper [16], It is complex, time-consuming, and labour-intensive for crime analysts to assess the crimes could have been committed by the same person within a wide set of crimes that occur every year in a major city (s). If automated, data-driven crime pattern analysis systems are made available to assist analysts, these tools may help police better understand crime trends, leading to more accurate assignment of past crimes and suspects' apprehension. To do this it proposes a pattern detection algorithm called Series Finder, which evolves from within a database a pattern of discovered crimes, starting from a "seed" of a few crimes. Series Finder combines both the general features of all patterns and the specific characteristics of each particular pattern, and the Cambridge Police Department's Crime Analysis Unit has seen positive results on a decade's worth of data on crime patterns.

In [15], the assessment shows that although the cameras tend to have a general effect, there were as many places that demonstrated little benefit from the existence of a camera as there were locations where the presence of a camera had a significant impact on crime. Overall, the introduction of

cameras was correlated with a 13 percent decrease in crime in the field of CCTV monitoring around camera locations, the 13 percent decline in overall crime at CCTV assessment sites can be attributed to very different activities.

After testing for general temporal patterns at each camera location, the reduction was statistically important, as was the seasonality and the number of days in each month. As the level of severe crimes around each camera location was generally too low to detect a measurable effect, this decrease was primarily a decrease in disorder offences. The implementation of CCTV was correlated with substantially different impacts on crime at each site; no crime reduction in the target area occurred at half of the sites. There was a significant decrease in serious crime at four places, with evidence of the distribution of positive benefits to the local streets. Crime reduction was assessed in the target area at certain locations, but there was strong migration to nearby streets.

V. SOLUTION

Already an official application named "Police Mitra Maharashtra" exists on play store which facilitates FIR registration but it has a lot of issues as it got 2.7 out of 5 ratings on play store by the users. We will create a centralized system for FIR. Our system will be an improved version and thus will fix all the existing issues present in the "Police Mitra Maharashtra" app. A user can register as well as check the status of FIR through our android application and website.

In today's world, CCTV cameras are used everywhere and they are considered as a "third eye" and with the help of AI we can make it smart but still, we are having cameras that are monitored by humans. We will be writing an anomaly detection program which can detect anomaly groups present in CCTV feed. An anomaly group (here) can be defined as a group of 3-4 people who are either fighting, Breaking thing, acting suspicious.

Cameras at railway stations, airport, public places will be equipped with face verification system which will be connected with a centralized database

of criminal faces. This system will help police to find and catch criminals. We will be making a cross platform software that will display all the CCTV camera feeds and will trigger an alarm whenever an anomaly or criminal is detected.

Today everyone is living two lives one of them is life of internet world. With this new world a new set of problems comes into action. Some of the problems are spam messages, spam Images, and spam YouTube videos, spam websites and spam news. A Lot of useful researches has been done in past which identifies spam content accurately but the main issue with them are they are not having a proper interface so that a common user with less technical background can use it in their daily life.

We will be making AI models which can identify spam messages, spam Images, spam YouTube videos, spam websites and spam news and then will deploy this to cloud so that it can be made available through android application and website to citizens. A chrome extension that will be showing red colour if the website you are visiting is fake and green when trusted. It will show red colour before every YouTube video title if that video is spam and green when it is trusted. Reason why we are making a chrome extension along with android app and website is because opening website and app for task which are very often is not feasible.

Crime rates are always increasing day by day and a majority of these crime happens with women. Our solution is especially given for securing women in our smart city but can be helpful to all the citizens. The problem with all the existing women security applications is that they send the emergency notification to the family members or some high authorities but they may leave at a very far distance from the user's daily travel path where she needs help and this is the reason why they reach late because they are not near.

In our solution, the application will automatically detect if the user is in the problem or not and if they are in trouble then an emergency alert (It consist of GPS location of the user) will be triggered which will be sent to the helpers on the path. As per training given to helper, they will respond firstly by

calling to the user and if the user didn't pick up the call then they have to reach that location.

For a smart city, controlling crime is a major concern. Crime data is increasing day by day and police in big cities like New York have set examples of how they are reducing the crime rate with the help of crime data. The problem here is in collecting good crime data specifically for Aurangabad so that our data analysis techniques draw some good analysis specifically for our smart city. After that, we need to strategize solutions as per the patterns in crime data. By analysing data for major crimes such as shootings, murders, rapes, and robberies, etc. we can try to figure out the patterns and trends in the behaviour of these crimes also the area in which they are happening in large amount and then with the help of machine learning algorithms, we can try to reduce these crimes.

Intelligent video surveillance systems have become increasingly important in today's lives with the advances in computer science, communication technology, and internet engineering. Everywhere, they can be seen. Intelligent video surveillance is automated, network-based video surveillance, but higher-end video surveillance systems are distinct from general network video surveillance. The smart video surveillance device can identify and locate various objects automatically find anomalies on computer screen. It also offers the quickest and easiest means of alerting and providing valuable information which can help security personnel cope with the crisis more effectively. In addition, a smart video surveillance device can eliminate false positives and false negative phenomena as much as possible.

We checked out Aurangabad's police website and we found that they are making press releases which are PDFs contain information like Name, Crime, Crime area and also some unwanted details. We will write a script using python which will create a CSV file containing useful information after extracting these press releases. Making of Strategies:

- 1) *Predictive Policing*
- 2) *Improving community relations.*

3) Resource Allocation

4) Initiative Assessment

5) It can be used by police in reducing crime rate and catching criminals by automatic surveillance.

6) It can be used by females in our city for safe and secured living.

7) It can be used by all the citizens for easy FIR registration and small problems report filing.

8) It can be used by government officials for smart policing strategies.

One of the major ways to improve an efficient surveillance system is anomaly detection. Our project focusses on anomaly detection through our AI enabled model to capture surveillance feeds and detect any sort of anomalies and report it to the police departments for faster whereabouts of any future scenarios which may cause citizens a sense of fear.

Detection of anomalies is the process of identifying unexpected items or events that differ from the norm in data sets. And unlabelled data, known as unsupervised anomaly detection, is often used for anomaly detection. Detection of anomalies has two basic assumptions:

1) It can be used by government officials for smart policing strategies.

2) Their characteristics differ significantly from ordinary cases.



Fig. 1 Example of an image with acceptable resolution

Anomaly detection in a given collection is a technique for detecting an odd point or pattern. The word anomaly is also known as outlier. Earlier, researchers in data mining concentrated on other methods such as classification and clustering. The outlier is noticed as part of the method of data cleaning. However the view

changed in 2000 when researchers found that detecting abnormal things could help solve the real-world problems seen in detecting harm, detecting fraud, detecting abnormal health conditions and detecting intrusion.



Fig. 2 Website structure

ACKNOWLEDGMENT

We would like to express our gratitude to our guide Dr.S.P.S. Chauhan for providing us his mentorship and help whenever required throughout the course of our project. We would also like to express our gratitude to the computer science department of our college for providing us the platform and opportunity to be able to create our final year project even during adverse times.

REFERENCES

- [1] W. JerryChisumBrentE.Turvey, "Methods of Crime Reconstruction" Crime Reconstruction (Second edition), 2011, pg. 179-209
- [2] ShijuSathyadevan, Devan M.S., Surya S Gangadharan, "Crime Analysis and Prediction Using Data Mining", August 2014
- [3] Rahul Garg, Arun Malik, Gaurav Raj, "A Comprehensive Analysis for Crime Prediction in Smart City Using R Programming", 2018
- [4] Grover Vikas, Richard Adderley and Max Bramer, "Review of current crime prediction techniques", Applications and Innovations in Intelligent Systems XIV, pp. 233-237, 2007
- [5] Friedman Matthew, Ames Grawert and James Cullen, "Crime in 2016: Updated Analysis", Brennan Center for Justice. New York: NY, 2016.
- [6] Adderley, R., "The Use of Data Mining Techniques in Operational Crime Fighting, Intelligence and Security Informatics, Second Symposium on Intelligence and Security Informatics", 2004.
- [7] Brantingham, P., &Brantingham, P., "Patterns in crime. New York: Macmillan", 1984.
- [8] Álvaro Figueira, Luciana Oliveira, "The current state of fake news: challenges and opportunities", Volume 121, 2017, Pages 817-825
- [9] Pranav Bharti, MohakBakshi, R.AnnieUthra, "Fake News Detection Using Logistic Regression, Sentiment Analysis and Web Scraping", Vol. 29 No. 7 (2020).
- [10] Susan Li , "Anomaly Detection for Dummies Unsupervised Anomaly Detection for Univariate& Multivariate Data", 2019.
- [11] AnithaRamchandran, Arun Kumar Sangaiah, in Computational Intelligence for Multimedia Big Data on the Cloud with Engineering Applications, 2018.
- [12] Nina ViktoriaJuliadotter, Kim-Kwang Raymond Choo, in The Cloud Security Ecosystem, 2015.

- [13] SharmilaChackravathy, Steven Schmitt, Li Yang, "Intelligent Crime Anomaly Detection in Smart Cities Using Deep Learning", 2018.
- [14] Cameron Aundreia and Heather May, "Measuring the Effects of Video Surveillance on Crime in Los Angeles", Find in a Library with WorldCat. USC 02 Apr. 2017.
- [15] McClendon Lawrence and Natarajan Meghanathan, "Using Machine Learning Algorithms to Analyze Crime Data", Machine Learning and Applications: An International Journal, vol. 2.1, pp. 1-12, 2015.
- [16] T. Wang, C. Rudin, D. Wagner and R. Sevieri, "Learning to detect patterns of crime" in Machine Learning and Knowledge Discovery in Databases, Springer, pp. 515-530, 2013.
- [17] Y. Yuan, G. David and S. Zhao, "Machine Learning in Intelligent Video and Automated Monitoring", National Science Foundation of China., 2015.