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Analysis And Prediction On Crime Rate Ascended Against Women And Children's In India .

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ABSTRACT

The skill of handling huge dataset is anticipated for the growth of every data scientist's knowledge these days. Most of the concerns don't prefer working on samples. The preference is use of full data. Data mining in crime pattern would give more experience in handling large data sets on working with our local machines. Data management problems are the key. Classification of problems involved in handling data set size can be progressed easily using machine learning algorithms. This work is an analysis of crime pattern occurred against women in India using R-tool which addresses the critical and feminist crime occurring places in India. Major crimes have been selected for the analysis. I believe this can make some change in individual recidivism risk by women offenders. The frequent pattern mining techniques such as K-means clustering and Naive Bayes classification algorithm are used. The crime rate of each crime in each state is also detected. Ultimate estimation of crime pattern committed against women in India from 2001 to 2012 is done and predictions of crime pattern that would take place in future is also assessed by building a regression model. Mapping of the observations are plotted in India map to highlight the risk factor using R-tool.

Keywords: crime pattern; analysis; machine learning; big data; crime analysis; crime predictions; forecasting.

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INTRODUCTION

In our country the rate of crime against women has become one of the major social issues. The information that we receive from social network reveals the risk factor in a very less ratio. So the analysis on crime pattern exploring the rate of crime occurring against women will have more impact on safety and tracking. The occurrence of crime has become increasingly open and common. In order to make sense of using technologies through data to ensure the rating of crime for public sector by defining the problem using machine learning concepts for analysis, the process is executed by computers relying on the algorithm which has become a backbone of implementation worldwide. Especially in broadening the policies to make decisions and take action based on the evidences provided by computing for the government. This work can help in starting the measures for women safety and making criminal justice for women in India.

Crime in India that occurred against women is generally being a larger glitches of India. It is also believed that, India is second most populous country and hence plays major part in the development of India as a bane. It has so many cultural issues that causes women as a weaker sex and it is really important to cover the risk areas and make an awareness for Women Justice in India as soon as possible. We have gone through several crimes that has taken place in different States/UT from 2001 to 2012. This work is basically an important social issue that process the analysis of crime pattern committed against women in India.

The pattern of crime occurring in 95% of places are seen to linear. Hence to extract the data of crime from 2013 to 2017 the linear regression model is build and applied to the original data. The outcome of the model delivers the data from 2001 to 2017 from the pattern of crime that happened from 2001 to 2012. And hence the further analysis for the crime occurring from 2001 to 2017 is analysed and visualised to reveal the reality of crime against women in India as a major issue that has to be focused on. Every women is unique and everyone has their own liberty to live a safe life in their native. The main motive of us in resulting the factors that are happening in India against women are beyond the estimation. The real issue is based on the democracy that has not been implemented in real life accordingly. Liberty to go out, work or mingle with opposite gender is not a freedom for a women. It is the respect and support that has to be given to her by the opposite gender in an honest way. Such factors are really needed to be implemented physically as well as mentally to make a strong and secure nation.

The overall survey on crime rate occurred against women in India results some realistic facts that are lacking in India.

- Psychological rationale
- Lacking in self defence and sex education
- Languid court system
- Domestic brutality acceptance
- Marriage is considered to be solution

From which Psychological rationale, languid court system, lacking in self-defence could be the major facts. Consideration of girls as objects is the society we are living in. Domination and oppression are the most crime originating fact. The aim of this study is to analyse the crime scenario of India. Many datamining techniques can be used for analysis.

Project Goals

- We aim to identify the pattern of crime occurred in every State/UT.
- The crime rate of four selected crime is estimated and visualized for every state/UT.
- The result is visualized in a bar chart for a clear understanding of the crime pattern.
- The observations are plotted in India map for highlighting the risk factor in every state/UT. Crime mapping is believed to be one of the important factor in crime pattern analysis.
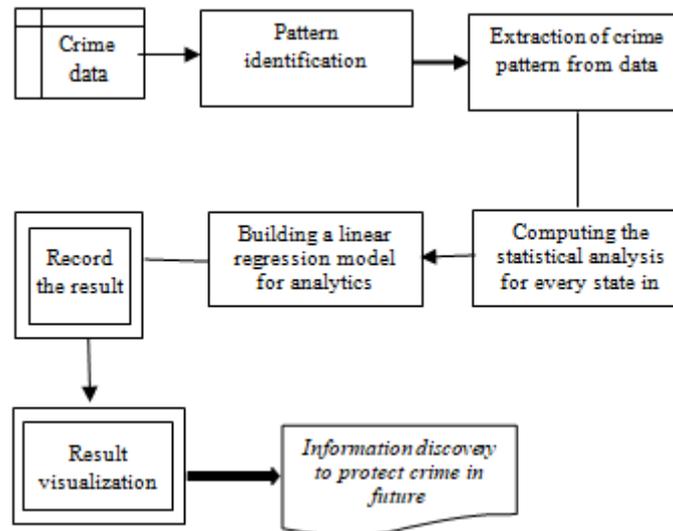
Fig 1: Proposed System architecture

The system is basically correlated with the process of datamining. The aim to find the crime pattern and analyse them by using machine learning algorithms for visualizing the result is the basic structure of the system. The datamining techniques provides wide range of applications to analyse big data. The crime dataset is loaded in R-tool for analysis. Pattern based techniques such as clustering, classification and regression are surveyed. To find the crime pattern of a grouped dataset, we find linear regression is more efficient and the model created for predictions of real values is found to be positive in mining the attributes that are needed. System starts by loading the dataset and pre-processing it for making it ready for analysis. Moreover, the contempt of the dataset is extracted by applying linear regression model on it. It produces the real values of predictions from 2013 to 2017 for overall analysis, i.e. from 2001 to 2017. From the final analysis the result shows the most

frequently crime occurring places in India with its crime rate highlighting the most affected places.

In the end of 20th century special analysis of crime is remained to be poised at the early stages for the development. Computerized mapping is supported by many of the capabilities and its statistical analysis to control crime is believed to be the environment and nature of link between crime and habitation of the place. Our aim to sort out the problems of Indian women preventing from crime is crucial and is becoming proliferated. Hence the crime hotspots and the highlights of crime occurring from 21st century is aimed to analyse and identification of pattern for the crime taking place in every State/UT implemented. Substantially the research on crime pattern identification is needed to look for location as a major goal. Both social and information technology has been applied for this research as base. This can extensively specialized for police intervention for more value as an impact on social amity.

RELATED WORK

Reza Rawassizadeh, Elaheh Momeni, Chelsea Dobbins, Joobin Gharibshah, and Michael Pazzani, [1] proposed frequent behavioral pattern mining using wearable devices. A set of scalable algorithms that have been used to identify patterns of human daily behaviors. The data has been extracted from multivariate temporal data using smart devices like smartphones and smartwatches. By analyzing the data on the device, the user has control over the data i.e., privacy and network cost will also be removed. In this work, they have used two real-world data sets to benefit their research. It is the Human-centric lifelogging data set in one hand and Hardware centric on another hand. The recommended systems to implement the concept are Healthcare and Transport optimization. But still, it lacks in wide acceptance of mobile sensing applications in real-world settings.

Yadav Chhay, [2] explains that according to the crime rates against women is increase day by day, the new problems are faced by the law organization. To overcome this cause more burdens on the crime against

women resources. The law organization is able to generate such increases or decreases in crime, so it is necessary to find out the most useful method to control and avoid crimes against women. The aim of this paper is to classify clustered crime against women based on occurrence frequency during different years by the process of Data mining. Data mining is used for analysis, investigate and discovery of patterns for the occurrence of different crimes against women. A hypothetical model in light of information mining strategies, for example, grouping and characterization to real crime dataset recorded by OGD are connected. Here the k-means clustering, KNN algorithm, decision tree algorithm and prediction method are used for the classification and clustering of crimes for future purpose.

Mohammad Al Boni and Matthew S. Gerber, [3] proposed different methods and experiments that begin to fill the gap that are present in existing work. In the existing work of statistical crime prediction, it is not investigated about the micro-level movement patterns of individuals in the area of interest. Geotagged social media implicitly describe these patterns for many individuals; however, methods of extracting such patterns and integrating them into a statistical model remain undeveloped. So, it is investigated to know the use of spatiotemporally tagged Twitter posts for inferring micro-level movement patterns, and real crime data to develop and test a model informed by such patterns. The results indicate the improved performance for about 15 of the 20 crime types that are studied when compared with the model with a baseline that does not use micro-level movement patterns.

D.Usha and Dr.K.Rameshkumar [4] has proposed crime pattern mining as the major theme in this work and also present the survey of various frequent pattern mining and Rule mining algorithm which can be applied to crime pattern mining. It is explained that an itemset is frequent if its support is greater than support threshold denoted by min support. In this paper, frequent pattern algorithm is classified into three ways such as Candidate generation approach, without candidate generation approach and Vertical layout approach. Moreover, a detailed description of the types of Association rule mining and the categories of measures are also given. It also explains about the different application areas of crime pattern in legal fields and other fields.

Anna L. Buczak and Christopher M. Gifford, [5] explain the manual inspection of crime data by analysts is limited, primarily due to the amount of data that can be processed concurrently and in a reasonable time frame. Further, complex relationships between various crime attributes can be overlooked by human analysts. Providing automated knowledge discovery tools that have become attractive to accelerate the efforts of local law enforcement. It explains the application of fuzzy association rule mining for community crime pattern discovery studied. Discovered rules were presented and discussed at regional and national levels. Rules found to hold in all states, to be consistent across all regions, and subsets of regions are also discussed. A relative support metric was defined to extract rare, novel rules from thousands of discovered rules. Such an approach relieves the need of law enforcement personnel to sift through uninteresting, obvious rules in order to find interesting and meaningful crime patterns of importance to their community.

Dr. M. VijayaKumar, Dr. S. Karthick and N.Prakash, [6] describe the use of GIS to grasp spatial and temporal patterns of crime offenses had become additional prevalent; GIS made it possible to optimize effectiveness within the reduction of crime and to extend the security of residents. The Vital method offered through GIS is that the identification of crime hotspots, or crime locations with a high crime rate. The identification of crime hotspots in time might even be awfully important; making it possible in the higher understanding of crime pattern build a criminal offense reduction display and conceding the strategic deployment of resources naturally and places after it will make the best distinction. Spatial-Temporal crime analysis plays a fundamental role in lots of security-related crime forecasting applications. This research carried out to inquire into and calculate the efficiency of connecting spatial and temporal crime factors for repeated events in particular high-density crime area. To exhibit the application of crime forecasting, this approach has been a practical analysis alternative in forecasting security informatics. In this analysis, Tamil Nadu areas of India were used as a case study.

Revatthy Krishnamurthy and J. Satheesh Kuma, [7] explain crime as an interesting application where data mining plays an important role in terms of prediction and analysis. Clustering is the process of combining data objects into groups. The data objects within the group are very similar and very dissimilar as well when compared to objects of other groups. It presents a detailed study on clustering techniques and its role on crime applications. This study also helps crime branch for better prediction and classification of crimes.

Matthew l. Williams, Pete Burnap and Luke Sloan, [8] critically examine the affordances and limitations of big data for the study of crime and disorder. It hypothesizes the disorder-related posts on Twitter are associated with actual police crime rates. The results provide evidence that naturally occurred in social media data which may provide an alternative information source on the crime problem. It used that the adds to the emerging field of computational criminology and big data are in four ways: (1) it estimates the utility of social media data to explain variance in offline crime patterns; (2) it provides the first evidence of the estimation offline crime patterns using a measure of broken windows found in the textual content of social media communications; (3) it tests if the bias present in offline perceptions of disorder is present in online The second; and (4) it takes the results of experiments to critically engage with debates on big data and crime prediction. The major drawback is that, without a theory-driven big data collection, transformation, and analysis, the answer to the substantive questions regarding social processes and mechanisms that concern criminologists is not possible.

Devendra Kumar Tayal, Arti Jain, Surbhi Arora, Surbhi Agarwal, Tushar Gupta, Nikhil Tyagi, [9] proposed an approach for the design and implementation of crime detection and criminal identification for Indian cities using data mining techniques. This approach has been divided into six modules, namely—data extraction (DE), data preprocessing (DP), clustering, Google map representation, and classification and WEKA_ implementation. The first module, DE extracts the unstructured crime dataset from various crime Web sources, during the period of 2000–2012. The second module, DP cleans, integrates and reduces the extracted crime data into structured 5,038 crime instances. The author represented these instances using 35 predefined crime attributes. Safeguard measures were taken for the crime database accessibility. Rest four modules were used for crime detection, criminal identification and prediction, and crime verification, respectively. Crime detection was analyzed using k-means clustering, which iteratively generated two crime clusters that were based on similar crime attributes. Google map improved visualization to k-means. Criminal identification and prediction are analyzed using KNN classification. Crime verification of our results is done using WEKA_. WEKA_ verifies an accuracy of 93.62 and 93.99 % in the formation of two crime clusters using selected crime attributes. This approach contributes to the betterment of the society by helping the investigation agencies in the detection of crime and criminals' identification, and thus reduces the crime rates.

Omowunmi Isafiade, Antoine Bagula, Sonia Berman, [10] presents a detail evidence to deliver the information of past crimes. The identification of the related offenses in a criminal investigation is an important goal for crime analysts. This paper revisits frequent pattern growth models for crime pattern mining. Therefore, it proposes a descriptive statistical approach, based on a quartile (floor-ceil) function, for the minimum support threshold (MST) choice selection, which is a major decision step in the pruning phase of the Traditional FP-Growth (TFPG) model. Revised frequent pattern growth (RFPG) model further proposes a Pattern-pattern (Pp) paradigm to identify tuples of subtle crime pattern(s) sequences or recurring trends in criminal activity. This paper presents empirical results in order to guide intended audience about future decisions or research regarding this model. These results indicate that RFPG is more promising than TFPG and will always ensure the utilization of a reasonable percentage of the crime dataset, in order to produce more reliable and sufficiently informative patterns or trends.

The literature review presents a brief overview on various applications of frequent patter mining techniques. Clustering and association rule mining algorithms are considered as an important step in most of the applications. The extensions of the same work is elaborated for better understanding. Wide variety clustering algorithms are implemented in majority of the fields. Problem solving techniques or algorithms are evolving in different research communities as a huge target.

SYSTEM ANALYSIS

To overcome the problems that is explode due to excess data pertaining as a result of development in social network, mobile and other web technologies, the big data analytics gives a solution. The concept of handling huge amount of data is known to be a big data. The discovery and analytics of the big data to improve the process in optimization and making a right decision at a right time by problem solving is known big data analytics.

A. Methodology

To learn the data, we started with the linear machine learning algorithms which is believed to be the best. It is very easy to understand and we focused on the following algorithms. The data from the year 2013 to

2017 is not available for our crime attributes. And so the linear regression was very helpful to make a decision in finding the real values by predicting them as follows.

1. Linear regression(for predicting real values from 2013 to 2017)
2. Linear discriminant analysis.
3. Logistic regression.
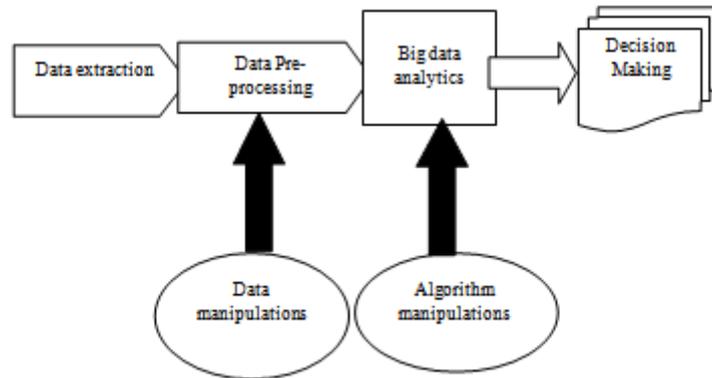
Fig 2: Data analysis of the system in a step by step process

The attributes has multiple inputs. It was trained by creating the simple linear regression model to get the real prediction values for the record. The recorded values from the year 2013 to 2017 along with the data from the year 2001 to 2012 is summarized and proceeded for the further analysis of crime pattern from 2001 to 2017 for visualization. The data is modelled as follows.

$$y = C0 + C1 * x \qquad (1)$$

The linear regression equation describes the relationship between the input variable (x) and the output variable (y) by finding the most appropriate coefficients which are C0 and C1. Moreover the relevant values are evaluated to give the most accurate values for the progression. The system is designed into two parts. The first part has the source as the destination of the system and the other part describes the overall process of the pattern estimation and result visualization.

DATA DESCRIPTION

The record of crime that has taken place in India against women is studies. The data analysis is performed to make decision in problem solving. The data is initially grouped as state, crime and year for pattern identification. Open Government Data (OGD) presents free government data in the website: www.data.gov.in. The attribute STATE/UT consists of all the 28 states and 2 Union Territories in India. The attribute CRIME HEAD consists of all the crimes that occur against women from 2001 to 2012. The available OGD (Open Government Data) is collected for crime pattern analysis from 2001 to 2014 and estimated a pattern for the next 5 years using linear regression model and recorded as a result for overall analysis.

Table 1: Sample Dataset – Crime Against Women and childrens (courtesy:mygovdata.in)

| S.No	Crime Head-Year 2014	Number of Cases
1	1 - Murder (Section 302 and 303 IPC)	1817
2	2 - Infanticide (Section 315 IPC)	121
3	3 – Rape	13766
4	4 - Assault on women with intent to outrage her Modesty (Sec 354 IPC)	11335

| 5	4.1 - Sexual Harassment (Section 354A IPC)	4593
6	4.2 - Assault on women with intent to Disrobe (Section 354B IPC)	711
7	4.3 - Voyeurism (Section 354C IPC)	88
8	4.4 - Stalking (Section 354D IPC)	1091
9	4.5 - Others assault	4852
10	5 - Insult to the Modesty of Women (Girls Children) (Section 509 IPC)	444
11	6 - Kidnapping & Abduction_Total (Section 363,364,364A, 366-369 IPC)	37854
12	6.1 - Kidnapping & Abduction (Section 363 IPC)	18682
13	6.2 - Kidnaping & Abduction in order to Murder (Section 364 IPC)	207
14	6.3 - Kidnapping for Ransom (Section 364A IPC)	172
15	6.4 - Kidnapping & Abduction of Women to compel her for marriage (Section 366 IPC)	12243
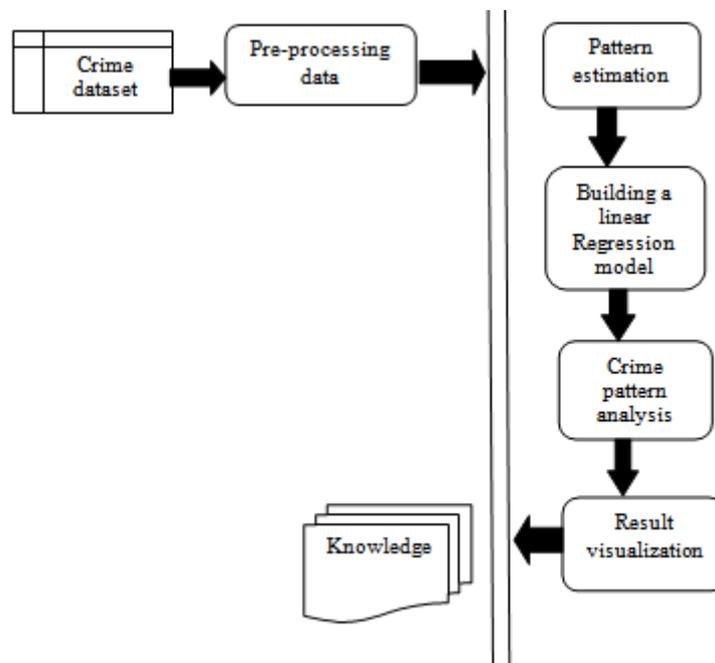
Fig 3. Architectural design to visualize the skeleton of the system

The collected data is pre-processed and further analysis for similar/identical pattern with which a linear regression model is being built and the crime pattern analysed. The result is further visualised and transferred from raw data to knowledge. The following are results of linear regression model for finding the real values of crime occurring in each state from 2013 to 2017. The screenshots of the result for Tamil Nadu alone is shown in the following pictures for sample. The process of linear regression is to get data from 2013 to 2017 and perform the data analysis for the overall observations, i.e. from 2001 to 2017. The result is recorded in a file to load the overall data for crime pattern analysis in every State/UT. The pattern estimation results in the form of linear regression to predict the values for the future. Here the values are predicted to analyse the overall impact that has taken place in India for the past 17 years.

In most of the places the regression is prioritized to analyse the most crime occurring places. The predicted values are derived from the linear regression model with the min and max limits for each year with the increment values based on the pattern learnt by the linear regression modelling algorithm in R-tool. Similarly, the same process is repeated for every state and represents the output values.
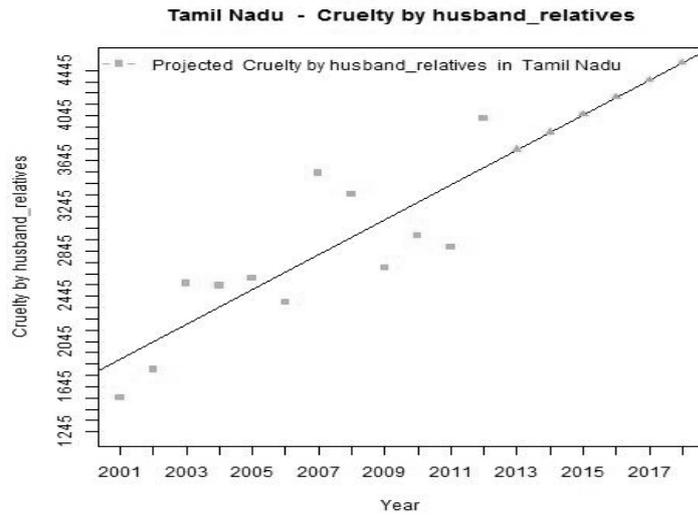
Fig 4: Cruelty by husband and relatives in Tamil Nadu from 2001 to 2017
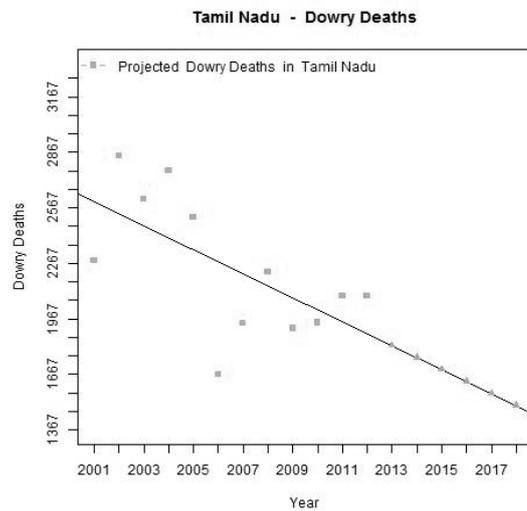
Fig 5: Dowry deaths in Tamil Nadu from 2001 to 2017
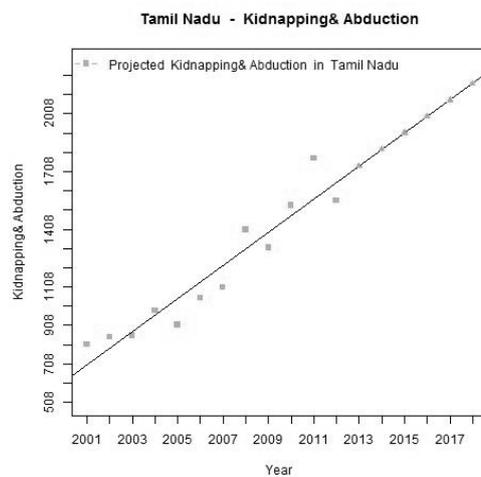
Fig 6: Kidnapping & abduction in Tamil Nadu from 2001 to 2017
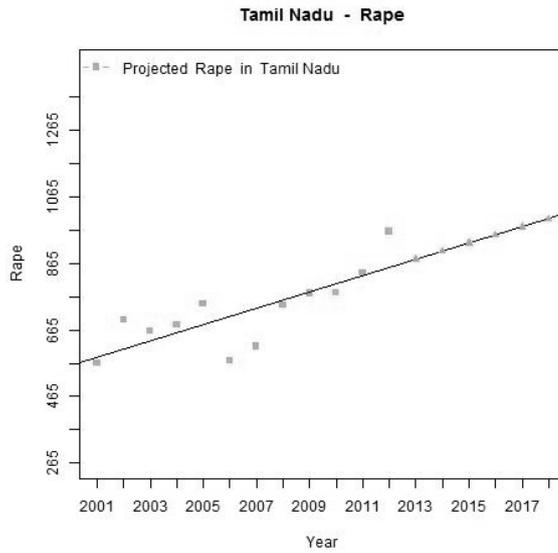
Fig 7: Rape in Tamil Nadu from 2001 to 2017

Fig .4, 5, 6 and 7 represents the linear regression of the crime occurred in Tamil Nadu from 2001 to 2017. The prediction values for each crime from the year 2013 to 2017 is observed for record. The overall count of each crime occurring in each State/UT from the year 2001 to 2017 is processed. For further classification of crime pattern analysis, the most appropriate results are projected and visualised for pattern estimation. The results are described in the upcoming sections.

PATTERN ESTIMATION AND RESULTS

The pattern results in highlighting Uttar Pradesh as most rape occurring place in India. The next place where it frequently took place is Maharashtra. Followed by Andhra Pradesh, West Bengal and Gujarat. Comparing Kidnap and abduction for each state with rape, it is again the same. That is Uttar Pradesh beyond 35000 times, Maharashtra 30000 times, Andhra Pradesh 24000 times, West Bengal 23000 times and Gujarat 22000 times.
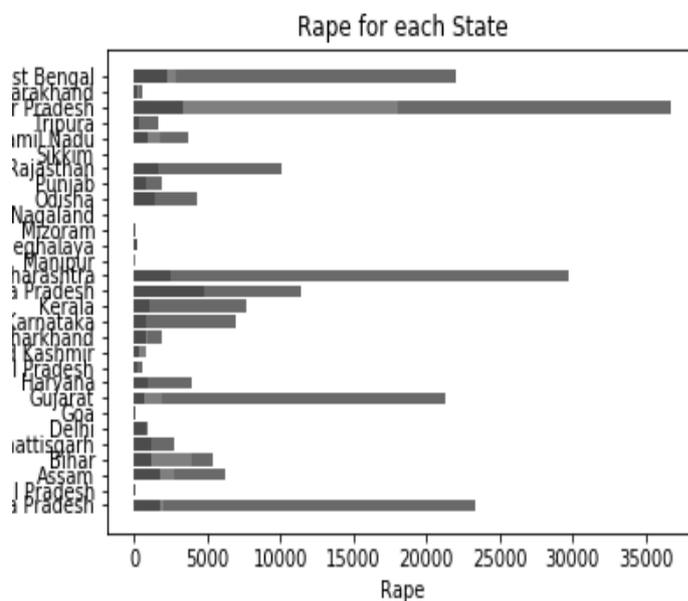
Fig 8: Crime rate of Rape in each State

Fig. 8 represents the amount of rape committed against women in all the states in India for the past 17 years. The most number of rape is highest in Uttar Pradesh and it is lowest in Nagaland, Mizoram and Meghalaya. Dowry deaths in India has caused more number of times is also found to be Uttar Pradesh, Maharashtra, Andhra Pradesh, West Bengal and Gujarat as highly crime occurring places in India.
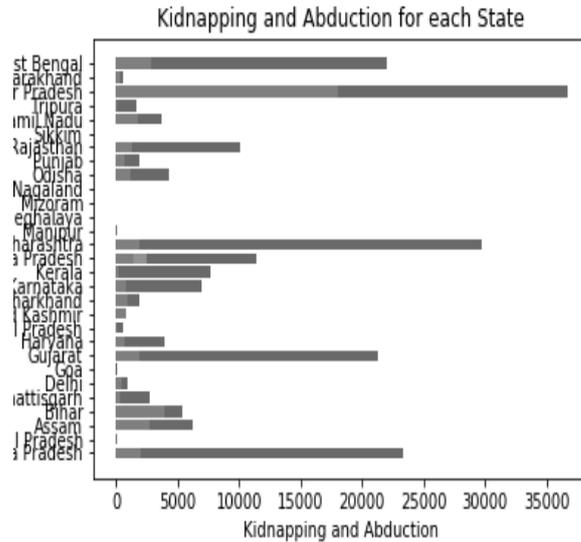
Fig 9: Crime rate of Kidnapping & abduction in each State
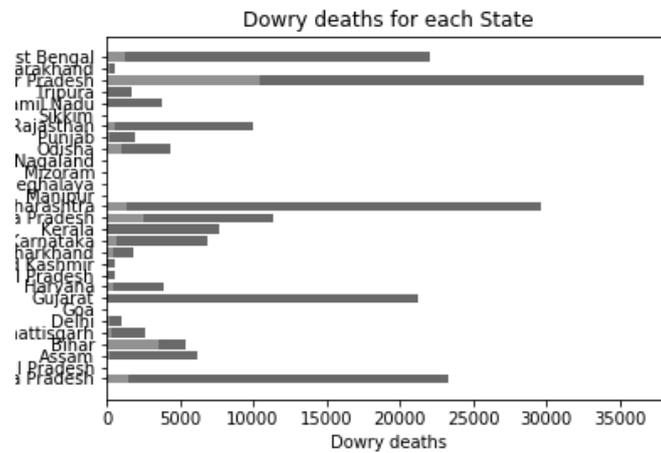
Fig 10: Crime rate of Dowry deaths in each State
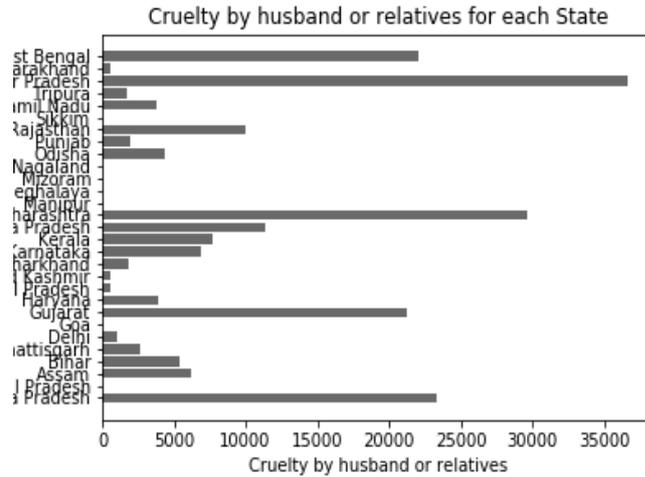
Fig 11: Crime rate of Cruelty by husband and relatives in each State
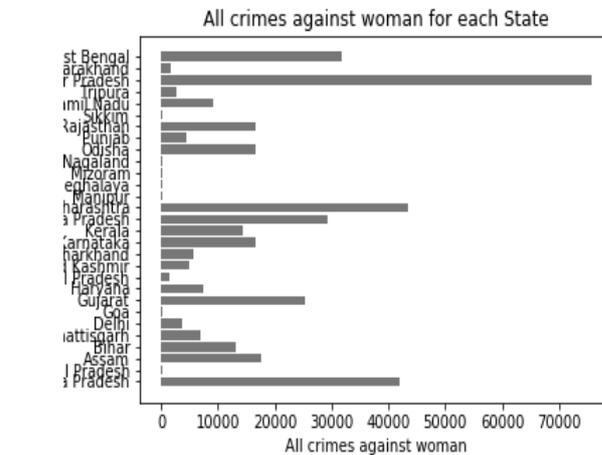
Fig 12: Overall crime took place in each State from 2001 to 2017

Fig. 9, 10, 11 and 12 are the screenshots of the visualized results of the amount of rape, Kidnapping and abduction, Dowry deaths, Cruelty by husbands and relatives and finally the overall analysis of crime occurred from 2001 to 2017 of each state. It represents the amount of each crime committed against women in India for the past 17 years. The most number of crimes is highest in the states of Uttar Pradesh, Maharashtra, and Andhra Pradesh. The crimes are found to be least in the states of Mizoram, Meghalaya and Manipur.

CONCLUSION

The techniques used to identify the pattern and trends can help in suspecting the incidents and may also highlight major cause and risks for further investigation. The patterns are supporting for the analysis of crime providing the inventions on women justice policies in future. R-tool is providing a better technical and statistical computing tool for big data analysis in an efficient way. It captures the crime series and helps in forecasting the future occurrences using regression model that is built by following up the crisis of pattern analysis algorithm for regression model in R. The computing formulas are standard in linear regression model. The observations are plotted in map to highlight crime rate and visualized. This work can help in enhancing the policies to prevent women and reduce the crime occurrence beforehand. Improvement in overall crime and justice can help to develop the safety measure prior. Awareness among the public to clarify the crime status must be created and educated to implement in real-time for a better living of women in India. Crime pattern analysis is done to show the findings and use the information for the consideration of crime that has took place in India both socially and technically to condense the crime creating an awareness.

To overcome the strategies that are influencing the crime status in India, the analysis of crime occurred can give the information to prevent the future crime before that occur as a precaution. The impact factor for the criminologists is highly rated for these kind of issues. And hence the big data computation can give answer for an effective decision to be made for the crime reduction in India against women.

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