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FIR Data Synchronization and Zonal Crime Heatmaps for Enhanced Policing

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ABSTRACT: The process of integrating regional crime heat maps with First Information Report (FIR) data synchronization is done to support modern policing. Information sharing between law enforcement agencies is improved by FIR data synchronisation. Geospatial data is used to visualise crime patterns in regional crime heat maps, which support proactive police. This method finds high-risk regions, facilitates the strategic deployment of resources, and improves response operations. By enabling quick, responses to crime trends, the integration of spatial intelligence and data synchronisation fosters community safety and confidence. By adapting to various police circumstances, this promotes more proactive, data-driven approach to law enforcement.

KEYWORDS: Modern policing, First Information Report (FIR), Regional crime heat maps, Proactive police, Geospatial analysis.

I. INTRODUCTION

The project, "FIR Data Synchronizations and Zonal Crime Heatmaps for Enhanced Policing", is to address the problem of enabling police organizations to combine First Information Reports (FIRs) with GIS tools in order to produce crime spots. First Information Reports (FIRs) are the earliest records that are made once a crime has been reported. They therefore provide useful information for criminal investigations and policy making in this field. However, the fragmentation and lack of standardization in FIR data from various sources sometimes hinders effective analysis and decision-making processes. By synchronizing the FIR data from 'New York Police Department', this project aims at creating a single database that allows for easy access and analysis. Additionally, we can create zonal crime heat maps using GIS tools to efficiently distribute resources towards preventing and addressing criminal activities while visually representing crime patterns. Synchronized FIR data along with zonal crime heatmaps by an integrated approach will hopefully offer valuable insights into what law enforcement needs, which will ultimately improve community safety, policing efficacy, and overall well-being. This project uses sophisticated analytics approaches to find patterns and trends in the data in addition to synchronizing FIR data and producing zonal crime heatmaps. At the end, the project aims to empower law enforcement agencies with actionable intelligence derived from comprehensive data analysis, leading to a safer and more secure environment for communities served.

II. RELATED WORK

Gamze Bediroglu and H. Ebru Colak(2023) proposed the study on crime data from Trabzon, Turkey, from 2011 to 2015 .The regional distribution of crimes was analysed and mapped using the Kernel Density Estimation (KDE) method. Hexagonal grid mapping and hotspot analysis techniques have been used to visualize spatial and temporal trends in criminal activity, particularly burglaries and assaults. The results identified high crime areas and seasonal differences.

GIS Crime Mapping to Support Evidence-Based Solutions By ungyun Yang (2019), This study utilized geospatial technologies to analyse gun-related crimes in four specific areas of Chicago over a five-year period Methodologies included spatial and space-time analysis, Kernel Density Estimation (KDE) method, alongside the development of a GIS platform for data dissemination and evidence-based solutions. The study aims to foster community engagement, understand needs, and inform initiatives to reduce gun violence and enhance youth programs.

A GIS-Based Approach Towards Prediction of Crime Hotspots by Supriya Panigrahy (2021) Currently, some commercial GIS or analytics program packages now provide spatial interpolation technique including inverse distance weighting (IDW), kriging, triangulated irregular networks (TIN) interpolation .The paper entailed weighted-overlay

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analysis, symbological heatmap analysis, choropleth analysis, kernel density interpolation, and Getis-Ord Gi* spatial autocorrelation analysis implemented to practically realize the essence of geospatial crime analytics.

III. PROPOSED METHODOLOGY

The proposed work has been developed using the website as a platform for all users. It is an interactive and responsive website that is used to display the total number of crimes that have occurred so far, and use this data to create a heat map of New York City. This website is made in different languages like HTML, CSS and Python. The basic structure of the website is made using HTML. CSS is used to add effects to a website and make it more attractive and usable. Python is used to render all the graphics and draw heat maps in New York. It should be noted that the website is designed for all users, so it should be easy to use and no one should have difficulty using it. The proposed system is trained in such a way that the dataset consists of different values, which consist of missing values. We removed all null values and created a standard data set. Since there is no need to store user data, all criminal datasets are stored embedded and the project is executed on a real-time server. Instead of algorithms, we use Python packages and libraries that perform all computer operations and also create a standard platform that can be used in all countries.

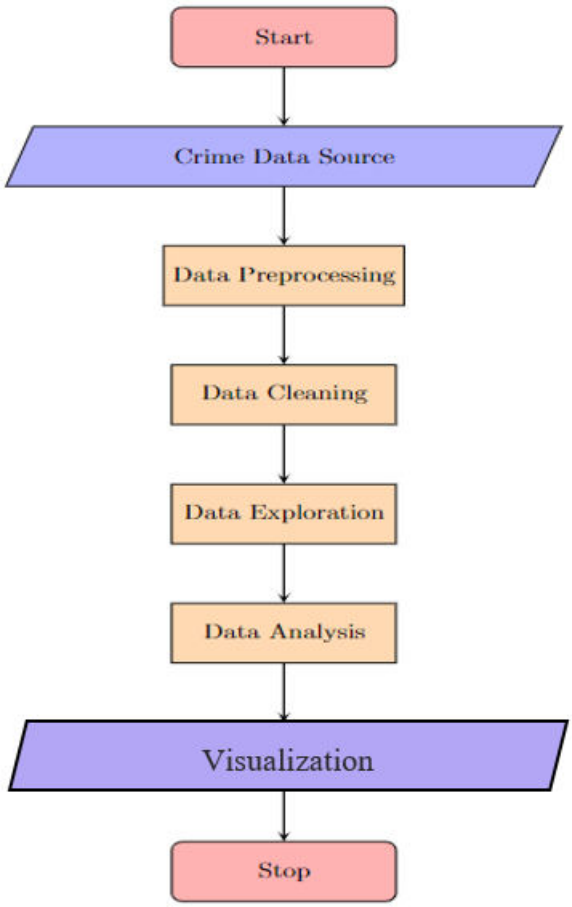

Fig.1: Frame work diagram

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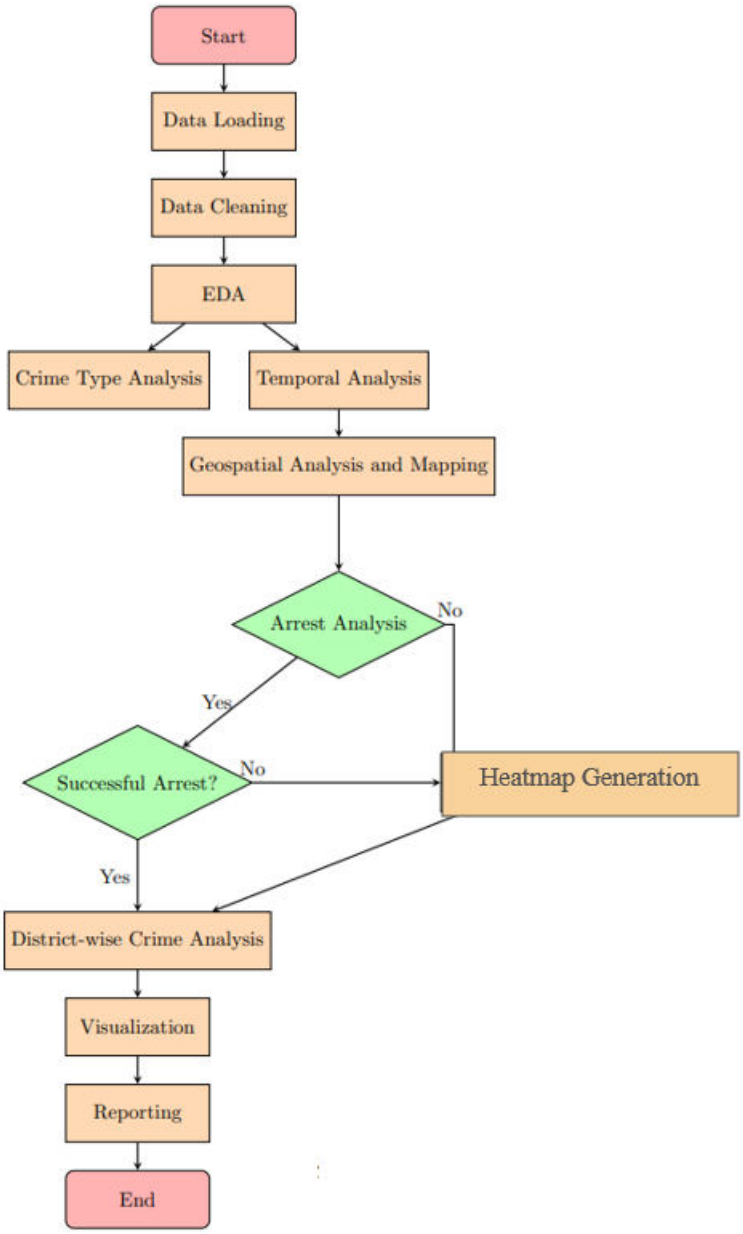

Fig.2: System flow diagram

IV. RESULTS AND DISCUSSION

In the fig.3.the graph shows the frequency of different types of crimes reported. Each bar represents a specific type of crime, and its height represents the frequency of occurrences of that crime type. In the fig.4.The “Frequency of Crimes Per Year in New York" graph offers a visual insight into the temporal patterns of reported crimes over successive years. This line plot displays the percentage of successful arrests over the years. It helps in understanding the effectiveness of law enforcement in solving crimes. By examining this graphical representation, observers can discern trends in crime rates over time, identifying periods of increase, decrease, or stability in reported crime incidents. In the fig.5.The "Pie Chart of Arrests" provides a succinct representation of the distribution of arrests in relation to reported crimes. In this visualization, the pie chart is divided into two segments: one segment represents the percentage of crimes where arrests were made, while the other segment represents the percentage of crimes where arrests were not made. In the fig.6.The "Bar Graph of District-wise Crime Counts" offers a visual depiction of the distribution of reported crimes across various districts within a specified area. Each bar in the graph corresponds to a

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distinct district, with the length of the bar directly proportional to the total number of reported crimes within that particular district. Districts with taller bars indicate higher levels of reported crime activity, whereas districts with shorter bars suggest lower levels of reported crime incidents. In the fig.7. The "Map of Crimes in New York" offers a geographical visualization of reported crimes that occurred within New York. Each marker on the map represents an individual reported crime incident, with its placement indicating the location where the crime occurred. By clicking on each marker, users can access detailed information about the specific crime, including its unique crime ID, date and time of occurrence, type of crime, description of the incident, and the address where it took place. In the fig.8. The "Heatmap of Crime Locations" visually represents the density of reported crimes in New York, with warmer colours indicating higher concentrations of reported crimes and cooler colours indicating lower concentrations. By analysing this heatmap, viewers can easily identify hotspots of criminal activity, typically corresponding to neighbourhoods or regions with higher reported crime rates.

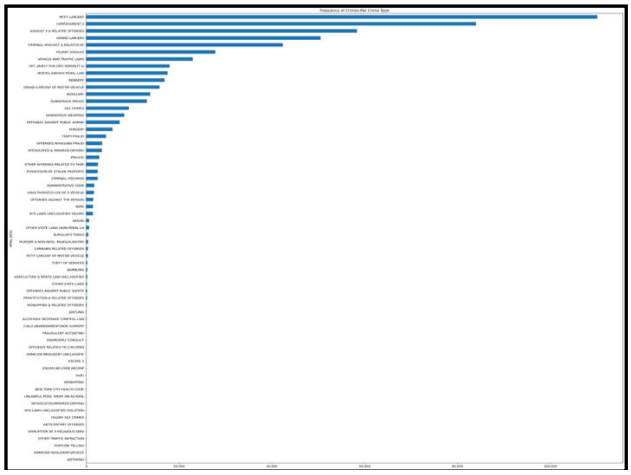

Fig.3. Frequency of Crimes Per Crime Type

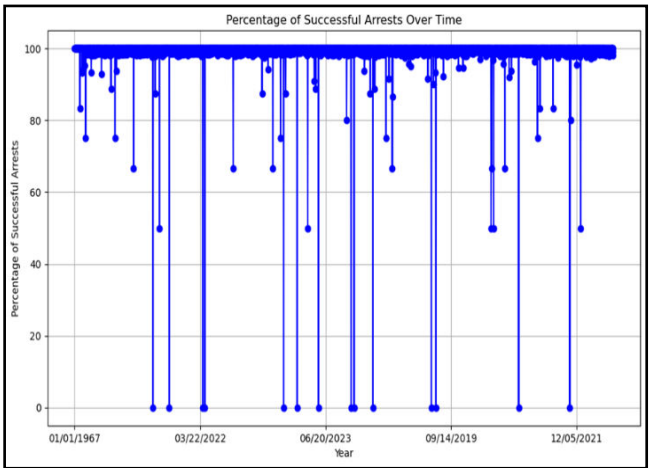

Fig. 4. Frequency of Crimes Per Year

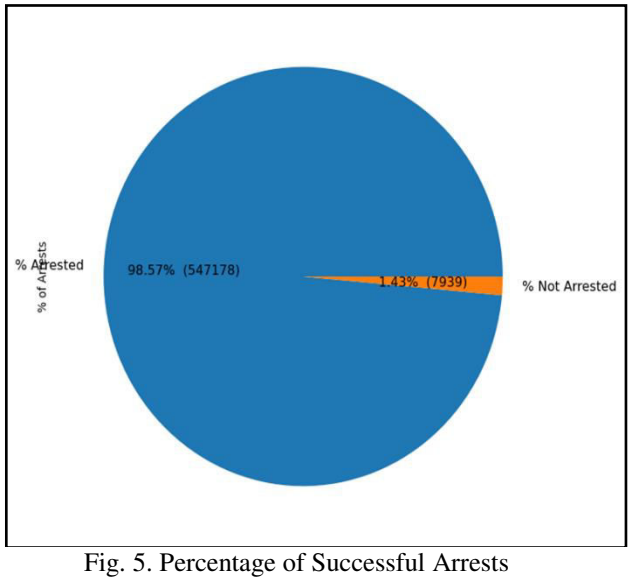

Fig. 5. Percentage of Successful Arrests

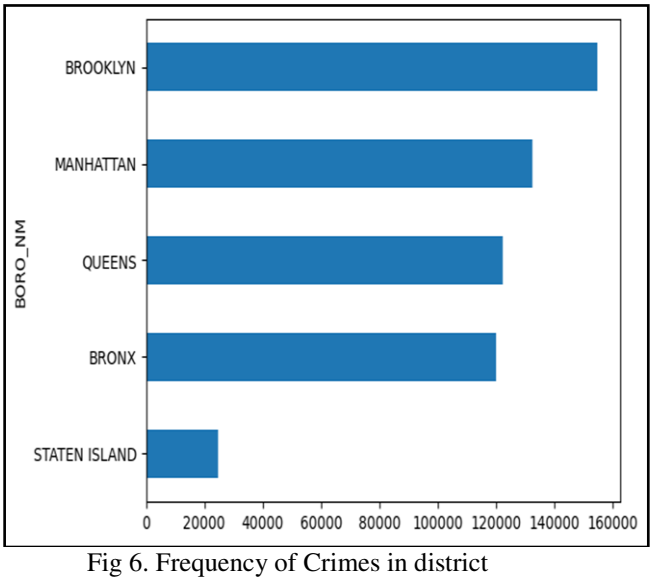

Fig 6. Frequency of Crimes in district

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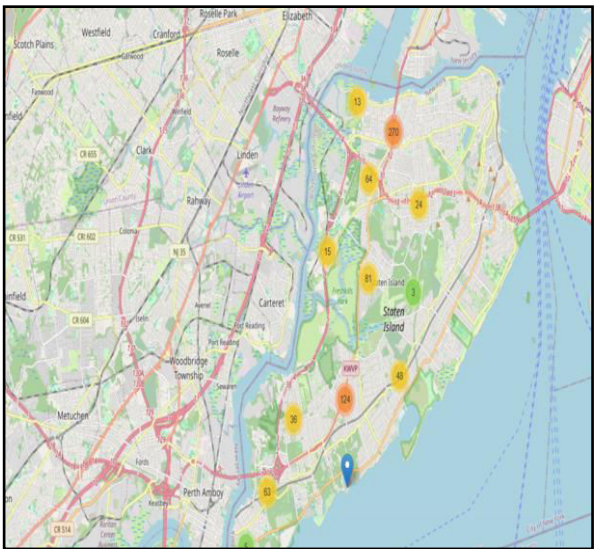

Fig 7: Image of total crimes in New York

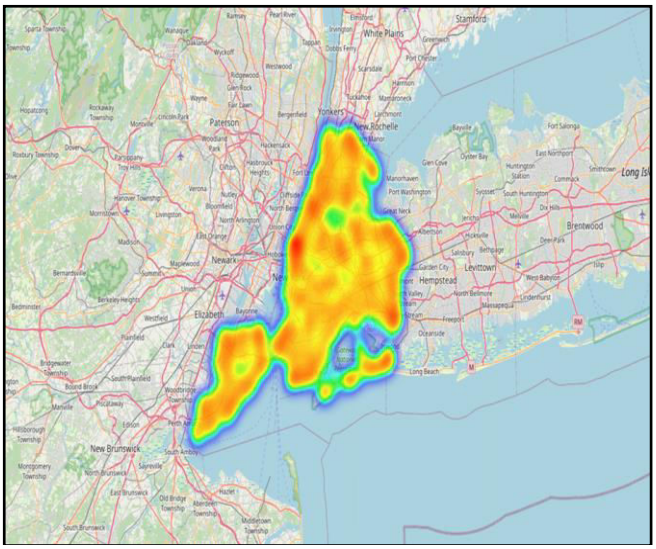

Fig 8: Crime heat map of New York

V. CONCLUSION

In conclusion, "FIR Data Synchronization and Zonal Crime Heatmaps for Enhanced Policing in New York" presents a comprehensive solution to address the challenges faced by law enforcement agencies in managing and analysing crime data effectively. By integrating FIR data synchronization and the generation of zonal crime heatmaps, coupled with the development of an interactive and responsive website, the project aims to provide law enforcement personnel and the public with valuable insights into crime patterns and hotspots in New York City.

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