Analyzing Patterns and Outcomes of Crimes and Arrests in Urban Areas of Los Angeles in USA

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1 Introduction

This project leverages a comprehensive dataset of crime reports to explore patterns and correlations within urban crime and law enforcement activities in Los Angeles from 2020 to present. The project intends to optimize policing tactics and improve public safety measures by applying data-driven insights. The analysis aims to ascertain if aggressive law enforcement actions are linked to noticeable drops in crime by comparing the number and kind of arrests with the crime rates in particular neighborhoods. This analysis is crucial for city planners, police departments, and community leaders striving to allocate resources effectively and improve safety in urban environments.

2 Research Questions

- Does the frequency and type of arrests correlate with reductions in crime rates in specific neighborhoods over time?

- Are there identifiable patterns in victim demographics (age, sex, descent) for specific types of crimes?

3 Data Sources

Both the dataset reflects the crime and arrest incidents in the City of Los Angeles from 2020 to present respectively. This datasets are transcribed from original arrest reports that are typed on paper and therefore there may be some inaccuracies within the data. Some location fields with missing data are noted as (0°, 0°). Address fields are only provided to the nearest hundred block in order to maintain privacy.

- **Dataset-1:**
  Data Source: The Home of the U.S. Government's Open Data
  Metadata URL: Crime Data from 2020 to present
  Data URL: Download CSV Dataset

Data Type: CSV
License and Permission: Licensed under the CC0 1.0 Universal Public Domain Dedication, allowing unrestricted use, modification, and distribution.

- **Dataset-2:**
  Data Source: The Home of the U.S. Government's Open Data
  Metadata URL: Arrest Data from 2020 to present
  Data URL: Download CSV Dataset
  Data Type: CSV
  License and Permission: Licensed under the CC0 1.0 Universal Public Domain Dedication, allowing unrestricted use, modification, and distribution.

4 Analysis

4.1 Correlation between the frequency of arrests and crime rates

First we will explore the yearly change of crime and arrest rates from 2020 to 2024 with the help of line graph.

Figure 1: Crime and Arrest rates over the year

The graph depicts crime and arrest trends from 2020 to 2024, starting with 180,000 crimes and 35,000

arrests in 2020, followed by a substantial drop in crimes to 100,000 in 2021 while arrests remained stable. Crime rates rebounded near 2020 levels in 2022 but arrests continued unchanged. By 2023, crime rates showed slight increases, stabilizing before a significant decline in 2024 to 120,000 crimes, with arrests persistently lower. This pattern suggests inconsistent law enforcement effectiveness and a possible fixed limit on resource capacity, despite fluctuating crime rates. The ongoing discrepancy between crime and arrest numbers also implies that many crimes do not result in arrests, possibly due to the nature of the crimes, investigative outcomes, or reporting practices.

Next, we will visually represent a correlation matrix between two variables: Crime Count and Arrest Count.
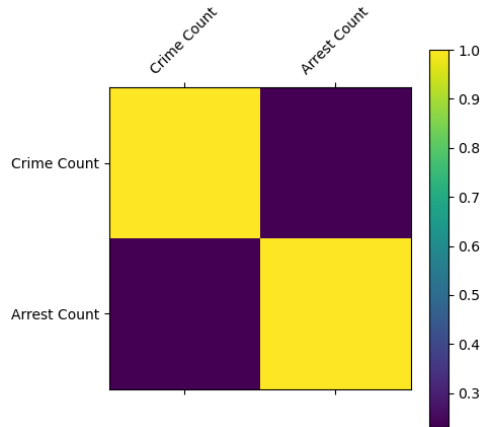

Figure 2: correlation matrix of crime and arrest count

The figure is a heatmap representing a correlation matrix between Crime Count and Arrest Count, illustrating their relationship.The off-diagonal cells, representing the correlation between Crime Count and Arrest Count, display a correlation coefficient of 0.231, suggesting a weak positive relationship. This indicates that increases in crime are weakly associated with increases in arrests. This suggests that factors other than crime rates may have a stronger influence on arrest figures, highlighting the limited predictive power of crime statistics alone for determining arrest trends.

4.2 victim demographics (age, sex, descent) for specific types of crimes

Victim's age: The graph titled "Average Age of Victims by Crime Type" presents a bar chart that illustrates the average age of victims associated with various types of crimes.
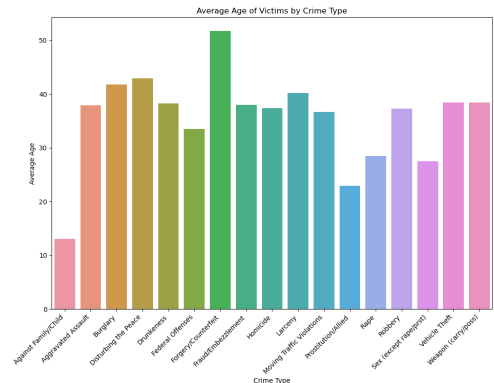
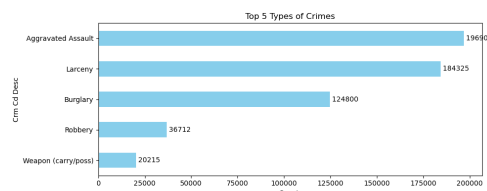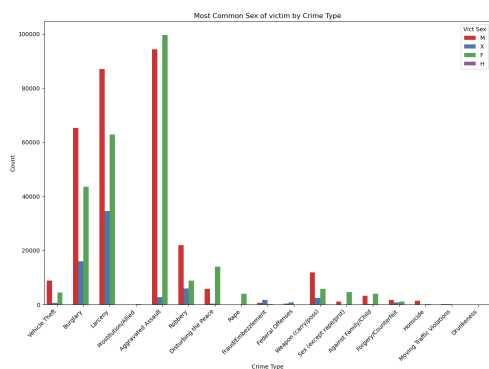

Figure 3: Average Age of Victims by Crime Type

The bar chart displays the average age of victims for various crimes, ranging from offenses like "Against Family/Child" with victims averaging around 10 years old, to "Fraud/Embezzlement" and "Forgery/Counterfeit" with victims around 50 years old. This visualization helps identify which age groups are most vulnerable to different types of crimes, highlighting the youngest victims in family-related crimes and the oldest in financial crimes.

Victim's gender : The graph titled "Most Common Sex of Victim by Crime Type" is a bar chart that illustrates the distribution of victim sex across various crime types.

This displays the distribution of victim sex across various crimes with bars representing the count of male (red), female (blue), and other specified categories (green and purple). The chart reveals significant variations with male victims predominantly higher in crimes like Larceny and Federal Offenses, while other crimes exhibit a more diverse victim profile. This visualization helps identify which gender groups are more frequently victimized.

Victim's descent : The chart titled "Most Common Victim Descent by Crime Type" presents a bar graph illustrating the frequency of victims by descent for various crime types.

This shows Larceny has the highest victim count,

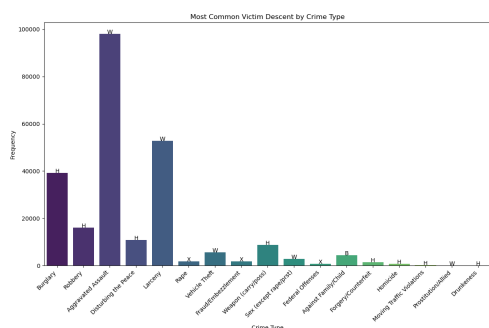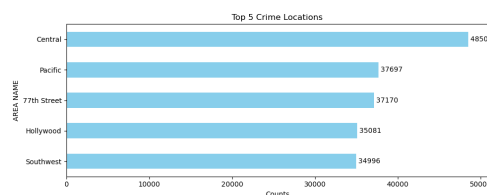Figure 4: Most Common Sex of Victim by Crime Type

Figure 5: Most Common Victim Descent by Crime Type

predominantly of White descent, represented by a tall blue bar. Aggravated Assault and Robbery also display significant numbers with victims mainly of Hispanic descent, as shown by purple bars. Federal Offenses and Forgery/Counterfeit have lower victim counts with a more varied demographic profile, including Hispanic and Black descents. Rape and Vehicle Theft are marked by a high frequency of victims of unspecified or diverse descent.

4.3 Crime Analysis

Top 5 types of Crime: The horizontal bar graph titled "Top 5 Types of Crimes" displays the counts of the most common crimes, highlighting Aggravated Assault as the most prevalent with 196,903 incidents, followed closely by Larceny at 184,325. Burglary comes in third with 124,800 cases, while Robbery and Weapon Possession record significantly lower frequencies at 36,712 and 20,215 respectively.

Top 5 crime locations: The bar graph titled "Top 5 Crime Locations" quantifies crime incidents across different areas, showcasing the Central region

Figure 6: Top 5 Types of Crimes

as having the highest crime count at 48,503 incidents. It's followed by Pacific with 37,697 crimes, 77th Street with 37,170, Hollywood with 35,081, and Southwest with 34,996. This visualization highlights the varying levels of crime activity within these areas, indicating that the Central area is the most affected.

Figure 7: Top 5 Types of Crimes

Distribution of Crime by location: The graph demonstrates varied crime frequencies across several regions with Larceny and Aggravated Assault depicted as high incidence crimes due to their significantly taller bars, indicating they are more common across the board. The Central area is highlighted for having consistently higher rates in numerous crime types, especially in Aggravated Assault, showcasing a region-specific crime trend. Conversely, crimes such as Homicide and Forgery/Counterfeit, positioned towards the right of the graph, are represented by much shorter bars, illustrating their lower occurrence and reporting frequency within the areas studied.
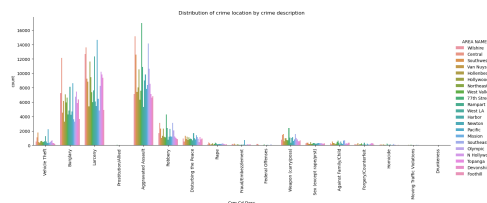

Figure 8: Distribution of Crime by location

5 Discussion and Conclusion

5.1 Discussion:

The correlation between crime and arrest counts is notably weak at 0.231, indicating that increases in crime have minimal association with rises in arrests, suggesting that other factors might be more significant in influencing arrest rates, such as law enforcement strategies or policy changes. Distinct patterns in victim demographics are evident across various crimes: young children are frequently victimized in family-related crimes, while older individuals are more susceptible to financial crimes like Fraud/Embezzlement. Additionally, males and individuals of Hispanic descent are often victims of crimes like Larceny and Aggravated Assault, respectively. The "Top 5 Types of Crimes" and "Top 5 Crime Locations" graphs highlight the Central area as a significant hotspot for crime, particularly Aggravated Assault and Larceny, underscoring the need for targeted law enforcement and community interventions to address these prevalent issues. This data supports strategic resource allocation and the development of specific community safety measures to enhance public safety effectively in regions most affected by crime.

5.2 Conclusion

The data suggests that while crime rates and arrests are weakly correlated, they do not necessarily predict one another directly, underscoring the need for a multifaceted approach to crime prevention and law enforcement that goes beyond mere surveillance or patrolling. Instead, more emphasis might be needed on community engagement, policy reform, and resource allocation tailored to the dynamics of specific areas and demographic groups.Victim demographics highlight a critical area for intervention, showing that different groups are uniquely vulnerable to certain crimes. These insights should drive specialized support services and prevention programs, focusing on the most at-risk groups identified in the data—children in family-related crimes and the elderly in financial crimes.

Ultimately, improving law enforcement effectiveness and reducing crime rates will likely require a combination of strategies, including better resource utilization, enhanced community policing efforts, and policies aimed at addressing the root causes of crime specific to different community demographics. Addressing these issues holistically could lead to more significant reductions in crime and more effective use of arrest powers, tailoring responses to the needs of different communities as elucidated by crime and arrest data trends.