Matlab Project Report

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1 Introduction

In the project, I explore the data of crimes in Chicago from 2015 to 2022, and visualize them with different types of figures and diagrams. First, I went through data cleaning and processing. I split the data of crimes from 2001 to current into a subset of data from 2015 to 2022 and a subset of data for 2022. Then, I conducted error detection for community area data and abandoned some data points after the unexpected characters. The report will mainly focus on the visualization of data and the analysis of the results.

2 Visualization and Analysis

2.1 Crime Numbers

The accumulated crime number shows the total crime number since 2015 till the year studied. The number is increasing almost linearly except that since 2019, the increasing rate has been smaller, but the yearly number of crimes is

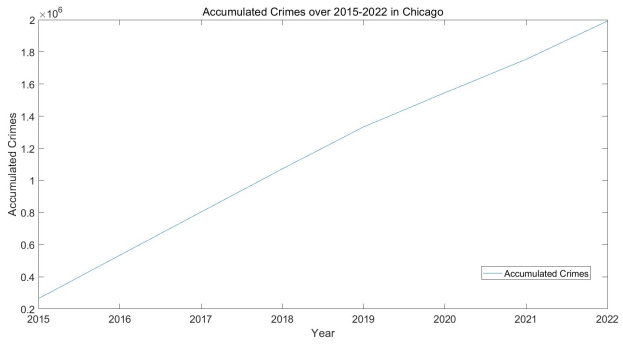

Figure 1: Accumulated Crime Number from 2015 to 2022 in Chicago

still significant. The magnitude of data is 10^6, so the crimes in Chicago are rather prevalent.

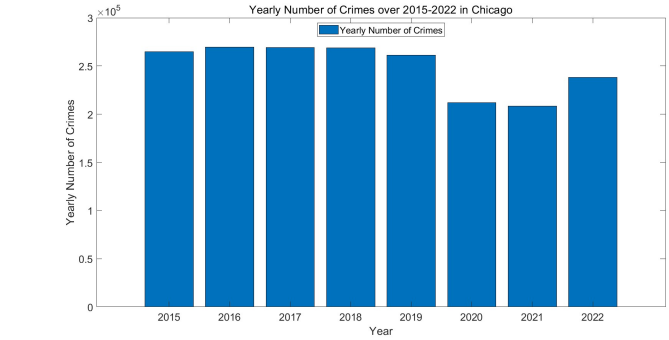

Figure 2: Yearly Crime Number from 2015 to 2022 in Chicago

From Figure 2, we can observe a relatively steady number of yearly number of crimes. Yet, since 2020, the yearly number of crimes has dropped obviously, which may be due to the pandemic. During pandemic, the death toll is stunning and the whole society was under great impact so that many people spent less their time outside and many shops went bankrupt and shut down. People were keeping social distancing and in less contact with others. All these factors contributed to fewer crimes in Chicago. In 2022, we can observe an increase in crime number, which is because the shadow of pandemic is fading away and people were restoring to normal.

2.2 Crime Types

To study the proportions of each type of crimes conducted in Chicago, pie chart is utilized to show the proportions of the top ten crime types and the others in all. From Figure 3, we can see the most prevalent type of crime is theft, followed by battery and criminal damage, which is basically align with our expectations. It's a little surprising that Narcotics is also among the top ten crimes. Since many mild drugs are legal in U.S., the prevalence of Narcotics reveals a worse picture of using drugs. We can observe that beyond the dominant ones such as theft, battery, and criminal damage, the other types of crimes have roughly the same proportions.

To further look into the types of the crimes, the secondary descriptions are evaluated and made into a word-cloud figure where Larger words stand for higher frequency of occurrences in the descriptions of the crimes. 'Simple' is the most frequently used word, followed by 'automobile', 'domestic', and 'aggravated'. 'Simple' mainly occurs in 'BATTERY' type of crimes, usually along with 'domestic' in the original descriptions. This points to the fact that battery usually takes place in homes. The word "automobile" reveals that thefts often targets at automobiles. Other words such as 'handgun' and 'property' also

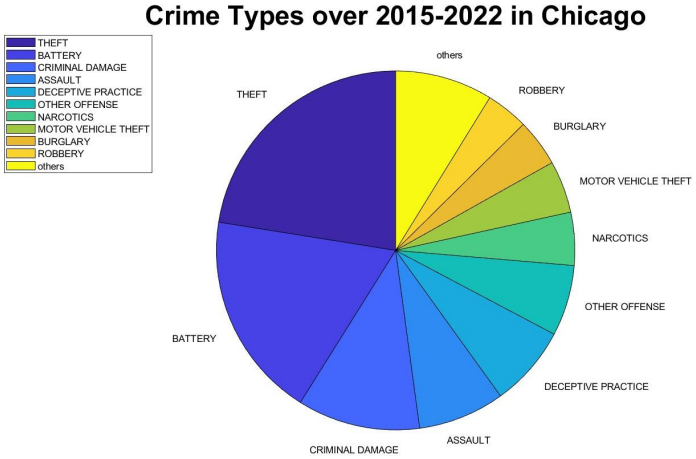

Figure 3: Crime Types over 2015 to 2022 in Chicago

reflect the American culture and the feature of Chicago where shooting crimes are not unusual due to the legality of possessing guns.

3 Crime Location

3.1 Crime Distribution among Districts

From Figure 5, we can see that the distribution is relatively average for those districts with crimes. Yet, from the original data, we can observe that some districts do not have crimes at all in 2022. This may be because the update rate varies for different districts and some crimes have not been recorded. Or simply some districts are safer than others. The reason may be the huge gap between the rich and the poor in Chicago.

3.2 Crime Distribution among Community Areas

From Figure 6, we can see that community 24 and 41 are the two most seriously affected area by the crimes. Community 30, 47, 27 also have a significant proportions of crimes. Basically, we can observe a trend that communities near the center of Chicago are more affected than those near the edges. This may be because the center area is more populated than the edge area.

4 Arrest Rate

For the DIY part, I choose to investigate the arrest rate of different districts in Chicago from 2015 to 2022.

Figure 4: Crime Description Word Cloud

From Figure 7, we can see a great variation between the arrest rates of the districts, from less than 0.15(15%) to more than 0.35(35%). Yet, the overall arrest rate is rather low. There are several reasons as listed below:
1) Some minor crimes do not require the criminals arrested.
2) The social governance in Chicago is not so satisfactory so that the total crime number is overwhelming.
3) The police and related institutes are not doing well at handling so many crimes.
There are some districts not showing the arrest rates. This is because there are no cases reported in those districts, so the arrest rate does not make sense.

5 Conclusion

The project has researched on the crimes in Chicago over certain time periods. Different types of diagrams are used to visualize various aspects of Chicago crime record.

We have concluded 1) the yearly crime number is relatively steady and only the pandemic has some impacts; 2) the major crime types are theft, battery, and criminal damage; 3) sub-type description always mentions 'simple', 'domestic', and 'aggravated'; 4) the crimes are almost evenly distributed among districts but are more dense near the center of Chicago on a community level; 5) the arrest rate is rather low with reasons still to be explored.

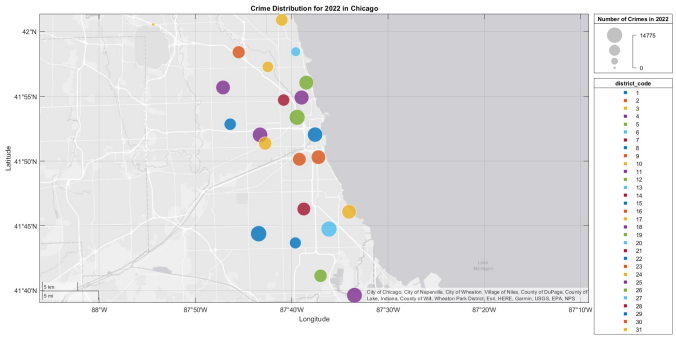

Figure 5: Crime Distribution among Districts in Chicago in 2022

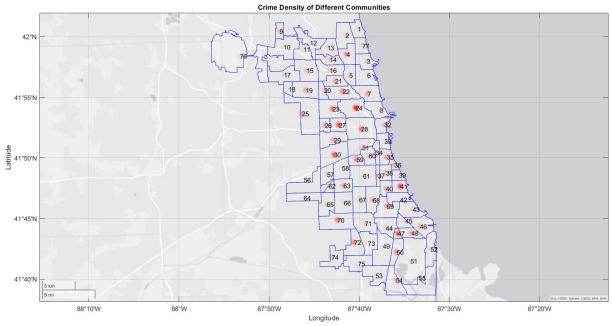

Figure 6: Crime Distribution among Community Areas in Chicago in 2022

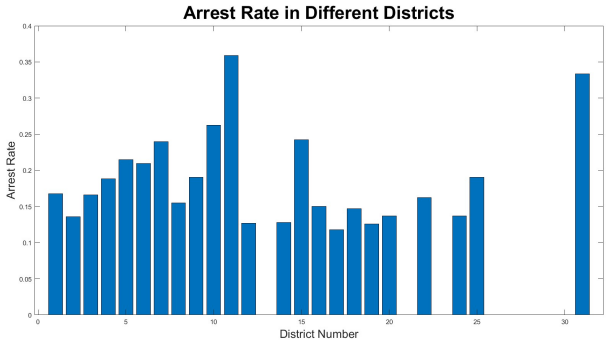

Figure 7: Arrest Rate in Different Districts in Chicago from 2015 to 2022