Analysing Crime Patterns in Vancouver Through Simple Data Aggregation

Introduction

Crime analysis can be influenced by various factors, including weather, air quality, economic changes, and more. Therefore, understanding these influences is quite important, as it allows us to analyse data and make decisions based on these findings. This report aims to explore the impact of weather conditions on the number of crimes in Vancouver, with the goal of presenting some meaningful data or visualisations that can be properly understood.

Data Overview

There are two primary datasets: ‘Vancouver crime data’ (Vancouver Police Department, n.d.) and ‘Vancouver weather data’ (WeatherStats, n.d.). ‘Vancouver crime data’ includes records of various crime types, with key details such as date, time, location, and neighbourhood. This dataset allows us to examine how crime incidents vary across different areas and conditions. ‘Vancouver weather data provides weather details like temperature, precipitation, and general conditions (e.g., clear, rainy). By aligning this with the crime data, we can analyse how weather influences crime rates.

There is also another dataset which assists the plotting part, it is about the Vancouver local area boundary. It contains geographic boundaries of neighbourhoods, enabling us to map and visualise crime distribution across the city (City of Vancouver, 2023).

How did I deal with these datasets?

To work with these datasets, I firstly cleaned the data by converting the 'datetime' column into day, month, and year format, which facilitated the merging of the two primary datasets, datetimes are from the year of 2012 to 2016. After the data was cleaned and formatted, I combined the crime and weather datasets into a single dataset, referred to as 'merged data,' to enable comprehensive analysis.

By exploring these datasets, I first used functions like ‘.info()’, ‘.describe()’, and ‘.head()’ to gain a better understanding of their structure, content, and key statistics. This initial exploration helped me identify any inconsistencies or patterns in the data, ensuring it was ready for further analysis. Then I represented the data through a combination of tables, figures, and maps to visualise the relationships between crime incidents and weather conditions across Vancouver.

Analysis

To begin the analysis, I examined the total crime incidents per month to assess how temperature might influence the number of crimes. Next, I analysed the average crime incidents per neighbourhood to identify which regions experience thCe highest number of

crimes. Finally, I explored Crime Incidents by Weather Condition to determine which weather conditions are associated with higher crime levels.

Crimes by Month
To begin the analysis, the total crime incidents per month to assess how temperature might influence the number of crimes. The Crimes by Month line chart (Figure 1) reveals that crime rates change throughout the years from 2012 to 2016, with a peak in October, reaching a maximum of 6,762 incidents, while the lowest occurred in February with 4,038 incidents. According to the map (map 2), we can see that downtown and west end regions got the most number of crime incidents in October.

Crimes count by Hour
Next, I analysed the Crime Count by Hour (Table 1) to identify the distribution of crimes throughout the day. The data indicates that the highest number of crimes occurs at midnight (Hour 0 which is 12:00 a.m.), with 19,334 incidents recorded. There is a decline in criminal activity during early morning hours, which then rises again in the late afternoon and evening.

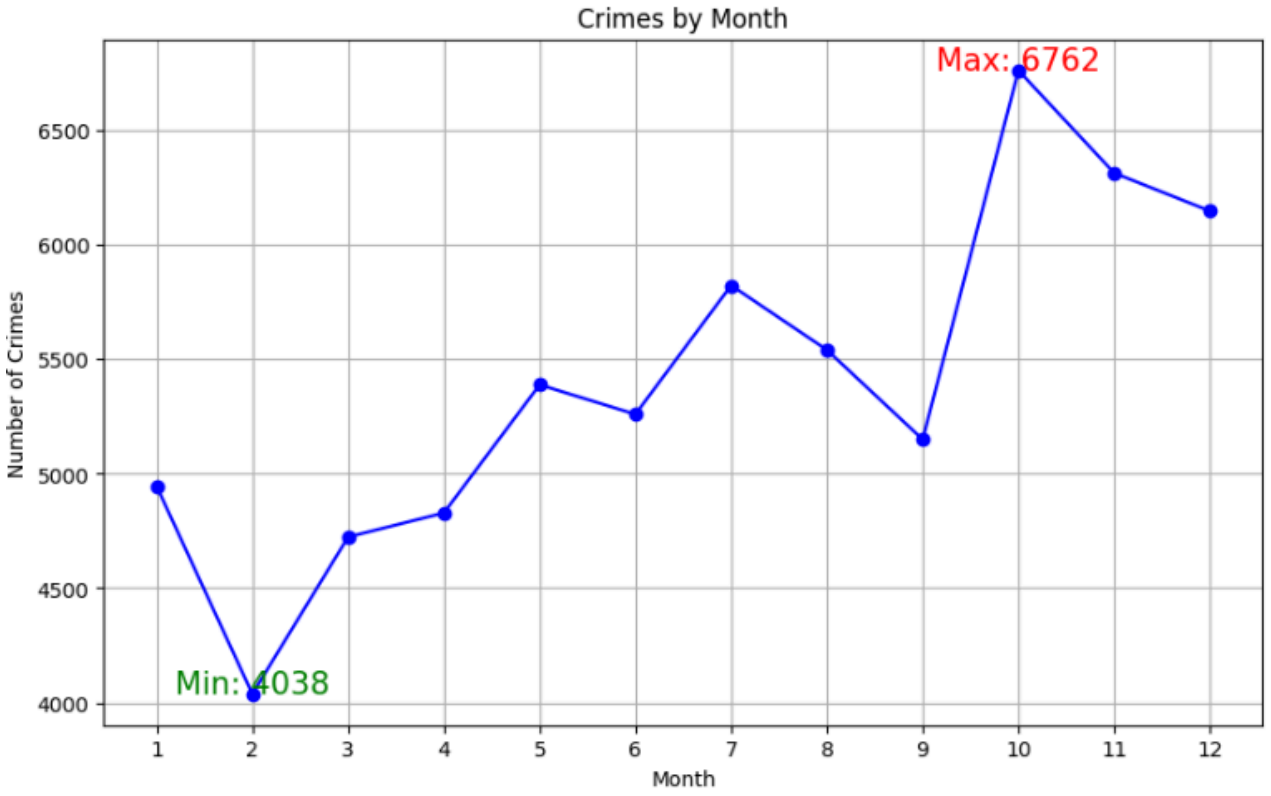
The most type of crimes happens
For the most types of crimes happening in Vancouver, I found that the most frequent types of crimes in Vancouver (Table 2), Theft from vehicles emerged as the most common crime, with 43,909 incidents, followed by Other Theft and Mischief. These crime types suggest a focus on property crimes in Vancouver, which could be addressed through specific crime prevention strategies I will talk about later, such as increased surveillance.

The weather condition causes the crime
The Crime Incidents by Weather Condition bar chart (Figure 2) provides how different weather conditions affect the number of crimes. The data indicates that most crimes occur during clear weather conditions, with a number 17,945 incidents happening under "sky is clear." This is followed by crimes caused during cloudy and rainy conditions.

Finally, to clearly show which regions got the most number of crimes when ‘sky is clear’, the Crime Incidents in "Sky is Clear" conditions by Local Area map (Map 1) shows the distribution of crimes by filtering from red to white colours. The map highlights that the west end region has the highest crimes during this weather condition, with over 1,000 incidents recorded.

Figures and Tables:

- **Figure 1: Crimes by Month (Line Chart)**



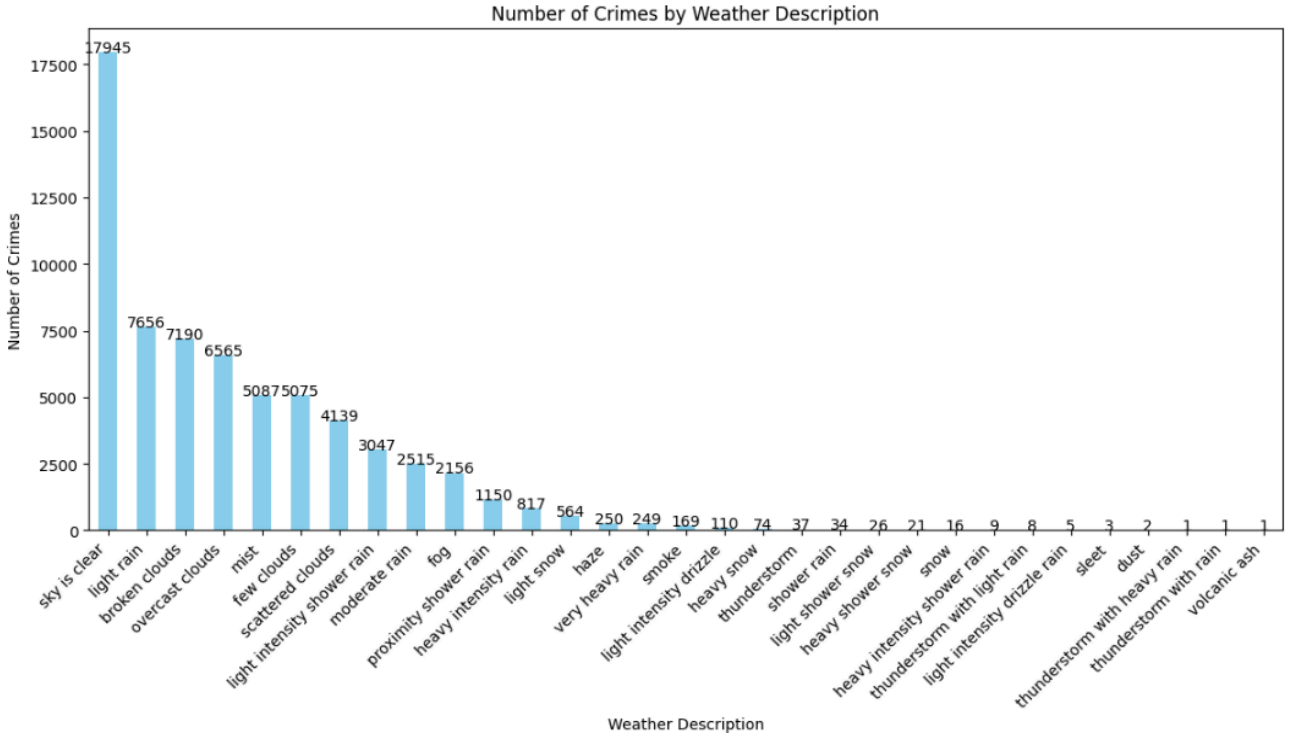
- **Table 1: Crimes Count by Hour**

	Hour	Number of Crimes
0	0	19334
1	1	1152
2	2	769
3	3	555
4	4	441
5	5	388
6	6	493
7	7	744
8	8	1218
9	9	1655
10	10	1361
11	11	1131
12	12	2895
13	13	1385
14	14	1687
15	15	2097
16	16	2550
17	17	3532
18	18	4417
19	19	3564
20	20	3593
21	21	3295
22	22	3893
23	23	2775

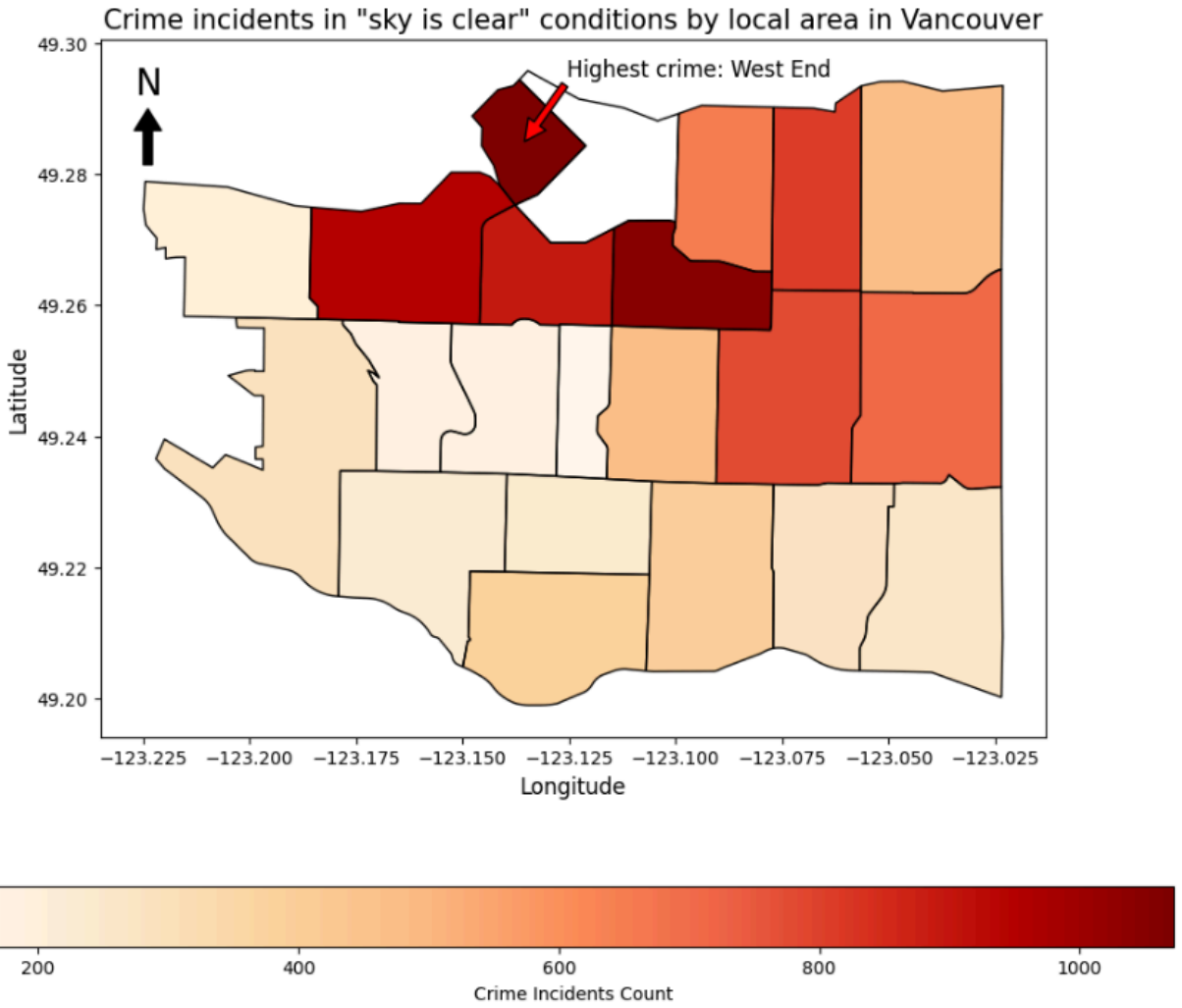
- **Table 2: The Most Common Types of Crimes**

```
TYPE
Theft from Vehicle                                    43909
Other Theft                                           18969
Mischief                                              18551
Offence Against a Person                              14075
Break and Enter Residential/Other                     13171
Theft of Bicycle                                      10516
Break and Enter Commercial                             9644
Vehicle Collision or Pedestrian Struck (with Injury)   6796
Theft of Vehicle                                       5443
Vehicle Collision or Pedestrian Struck (with Fatality)   62
Homicide                                                 44
Name: count, dtype: int64
```

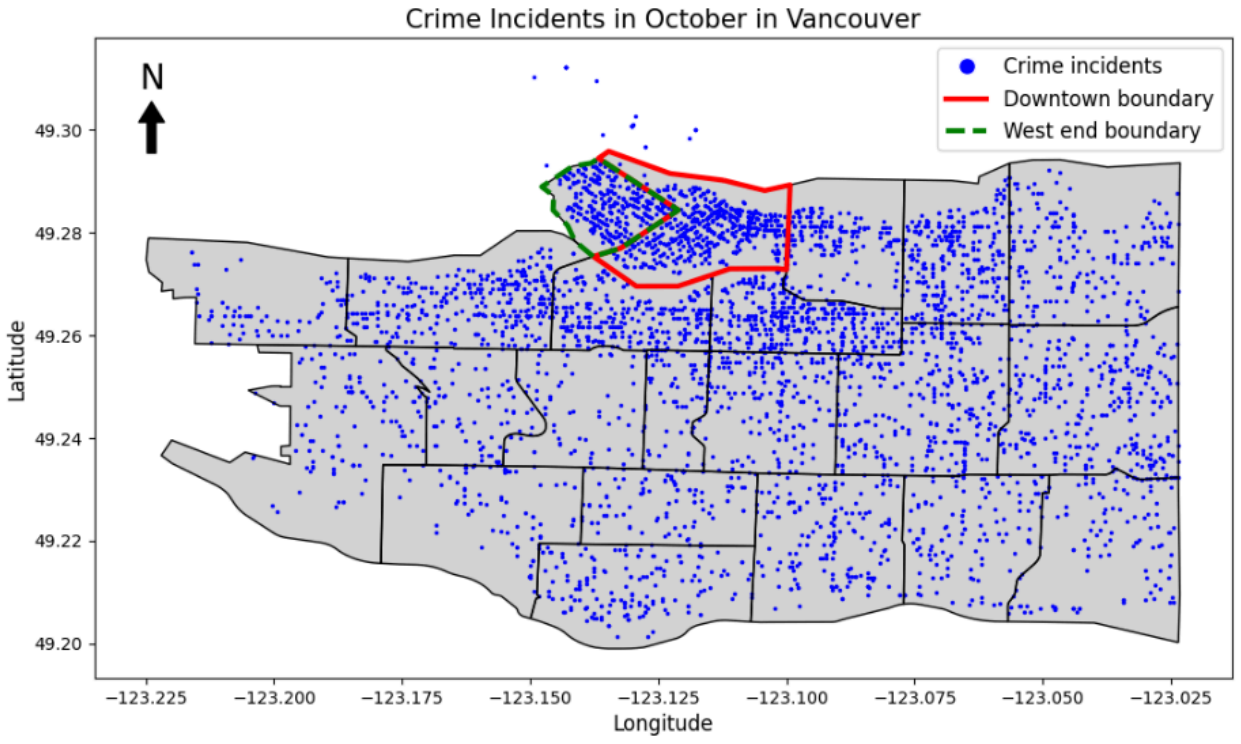
- **Figure 2: Crime Incidents by Weather Condition (Bar Chart)**



- **Map 1: Crime Incidents in "Sky is Clear" Conditions by Local Area**



- **Map 2: Crime Incidents in October in Vancouver**



Discussion after Analysing

Based on the analysis, October has the highest number of crimes, likely due to increased outdoor activity and shorter daylight hours, while February sees the lowest, suggesting that colder weather reduces crime. Crimes are most frequent late at night, particularly around midnight, with Downtown and West End being high-risk areas. Property crimes, especially vehicle theft, clear weather is linked to higher numbers of crimes, likely due to more people being outdoors.

To address these discussions, targeted law enforcement should focus on late-night patrols, especially in high-risk areas like Downtown and West End. Prevention strategies should prioritise property crime by improving lighting. Crime prevention efforts should be improved during clear weather conditions, particularly in identified hotspots like the West End and Downtown. These actions could potentially prevent the increase of crimes, so that people that live in Vancouver could also potentially be safer than used to.

Reference

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