PREMIER UNIVERSITY, CHATTOGRAM

Department of Computer Science & Engineering

6th Semester Artificial Intelligence Labratory Report

On

Crime Hotspot Detection

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CHAPTER 1

INTRODUCTION

1.1 Background

Crime hotspot detection is a branch of criminology and criminal justice that looks at places where crime is likely to happen. Crime hotspots are places where crime is concentrated and happens more often than in other places nearby. Crime zones have been studied and used in law enforcement, urban planning, and community development, among other areas.

In the past, crime hotspots were found by looking at crime maps and doing a statistical analysis of crime statistics. But as technology, data collection, and analysis have improved, machine learning algorithms and predictive models have been developed to help find possible hotspots and predict future crime trends. These models can take into account many things, like place, time, and social and environmental factors.

The goal of a crime hotspot identification project is to help law enforcement and other groups better use their resources to stop crime and make the public safer. It can also help with urban planning and community development policy choices. But it's important to keep in mind that crime hotspot detection projects must be done in an ethical way and with the protection of civil rights in mind, as there are concerns about possible bias and discrimination based on race, ethnicity, or other demographic factors.

1.2 Motivation

The idea is meant to make people safer and cut down on crime in high-risk areas. By figuring out where crime is most common, law enforcement and other interested parties can better focus their efforts and resources to stop crime and react quickly when it does happen. This could lead to less crime and a better neighborhood.

This project's other goal is to help policymakers make decisions about urban planning and community growth. By finding places with a lot of crime, lawmakers can learn more about what causes crime and take steps to stop it. This can include making the lighting better, having more police officers around, and putting money into neighborhood programs that bring people together and fight poverty.

This project can also help the public have more faith in the police by showing that they are taking steps to stop crime and make the public safer. This can make it easier for law enforcement officers and the community to work together, which is important for stopping crime and dealing with it.

CHAPTER 2

LITERATURE REVIEW

2.1 Related Works

Crime hotspot detection projects are relatively common in the fields of criminology, criminal justice, and urban planning. Many researchers and practitioners have developed tools and techniques for identifying crime hotspots and developing strategies to prevent crime in these areas.

"Crime Hotspot Detection and Analysis: A Survey"[1] by Mohd Helmy Abd Wahab and colleagues (2020).

"Crime hotspot detection using spatio-temporal data mining: A survey"[2] by Huy Quan Vu and colleagues (2018).

CHAPTER 3

METHODOLOGY

3.1 Proposed Methodology

- OSEMN - Commonly used Data Science Methodology
- OSEM - Our variant
- Linear Process

3.1.1 Data Collection

Collect a dataset of texts that are labeled with their respective sentiment categories.

3.1.2 Data Preprocessing

- Removing Missing Values : 98.55% entries retained
- Feature Engineering : Decomposing "Date" feature
- Data Aggregation : Grouping Data to count crimes per time point

3.1.3 Explore data

- Create a "Target" feature
- Label based on "Normal Distribution" and Intuition

3.1.4 Model data

- Supervised Classification Problem
- Imbalanced Dataset [28:51:21 ratio]
- 3 Samples used
- 7 ML algorithms tested
- Gradient Boosting Tree worked best

CHAPTER 4

EXPERIMENTAL RESULTS

4.1 Results

We have evaluated our models based on the following metrics that are common to most ML problems :
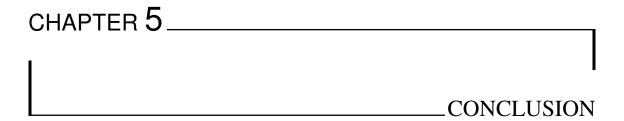
- Accuracy
- Precision
- Recall
- F1 Score
- Unweighted Average Recall

But, we also need a "PROBLEM-SPECIFIC" metric to improve the robustness of our work.

4.2 Summary

We have got an accuracy of 78.35%.

```
                     Accuracy: 78.35181678838698


        -------------------Confusion Matrix--------------------
              Predicted Alarm    0     1     2
              Actual Alarm
              0                 2484   570    2
              1                  525  4627  549
              2                    0   755 1579

        -----------------Classification Report-------------------
                     precision   recall  f1-score   support

                  0       0.83     0.81      0.82      3056
                  1       0.78     0.81      0.79      5701
                  2       0.74     0.68      0.71      2334

           accuracy                          0.78     11091
          macro avg       0.78     0.77      0.77     11091
       weighted avg       0.78     0.78      0.78     11091
```

CHAPTER 5

CONCLUSION

In conclusion, this project has demonstrated a promising level of accuracy in identifying potential crime hotspots. By providing law enforcement agencies with real-time insights into crime patterns and trends, the project has the potential to enhance their ability to prevent crime and promote public safety. In the end, this project has shown that it can be pretty accurate at finding places where crime is likely to happen. By giving law enforcement agencies real-time information about crime patterns and trends, the idea could help them stop crime and make the public safer. Still, it might need more work to make it work better in real-world situations. The project can make a big difference in the fields of crime prevention and law enforcement if it keeps getting better and better.

BIBLIOGRAPHY

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[2] W. M. H. A. Uddin M. S. Alsaqour R. Basri H., "Crime hotspot detection and analysis: A survey.," *Ambient Intelligence and Humanized Computing*, vol. 11, no. 2, pp. 817–834, 2020.