



# Crime Analysis Using DBSCAN

Course : Data Mining Techniques.

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# Introduction & Problem Statement

## 1 Introduction

Crime analysis is crucial for law enforcement & public safety.

## 2 Problem

Traditional crime mapping lacks efficiency in detecting patterns.

## 3 Solution

DBSCAN offers an advanced approach to identify crime hotspots.







# Literature Review & Why DBSCAN?

## Crime Data Analysis

- Data mining is widely used for crime pattern detection.
- Various clustering techniques are applied in crime analysis.

## Why DBSCAN?

- Detects irregularly shaped crime clusters.
- Automatically identifies noise (outliers).
- No need to specify the number of clusters.

# Methodology

1

## Data Collection

Crime dataset with location, crime type, time.

2

## Data Preprocessing

Handling missing values, scaling, encoding.

3

## Applying DBSCAN

Identifying high-density crime regions.

4

## Visualization

Scatter plots & heatmaps for better insights.

# Methodology



Data collection



Data processing  
clean data

DBSCAN



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An illustration of a city street at night. The sky is dark green with many small yellow stars. In the background, there are several tall buildings, some with lights on. A red crime scene tape with the text "ALL CRIME SCENES ARE OFF LIMITS" is strung across the street in a zig-zag pattern. On the street, there are several yellow evidence markers with the word "EVIDENCE" written on them. The street is lit by yellow streetlights, and there are some trees and bushes along the sidewalks.

# Data Collection & Preprocessing

## Data Sources & Features

- Public crime datasets, police records.
- Features: Latitude, Longitude, Crime Type.

## Preprocessing Steps

- Handling missing values.
- Feature normalization & encoding.
- Optimizing DBSCAN parameters.

# DBSCAN Algorithm & Implementation

## How DBSCAN Works?

Density-based clustering groups nearby points, detects outliers.

## Epsilon ( $\epsilon$ )

Defines the neighborhood radius.

## MinPts

Minimum points required to form a dense region.

## Implementation (Python Libraries Used)

- **pandas, NumPy** – Data processing.
- **scikit-learn** – DBSCAN algorithm.
- **matplotlib, seaborn** – Visualization.



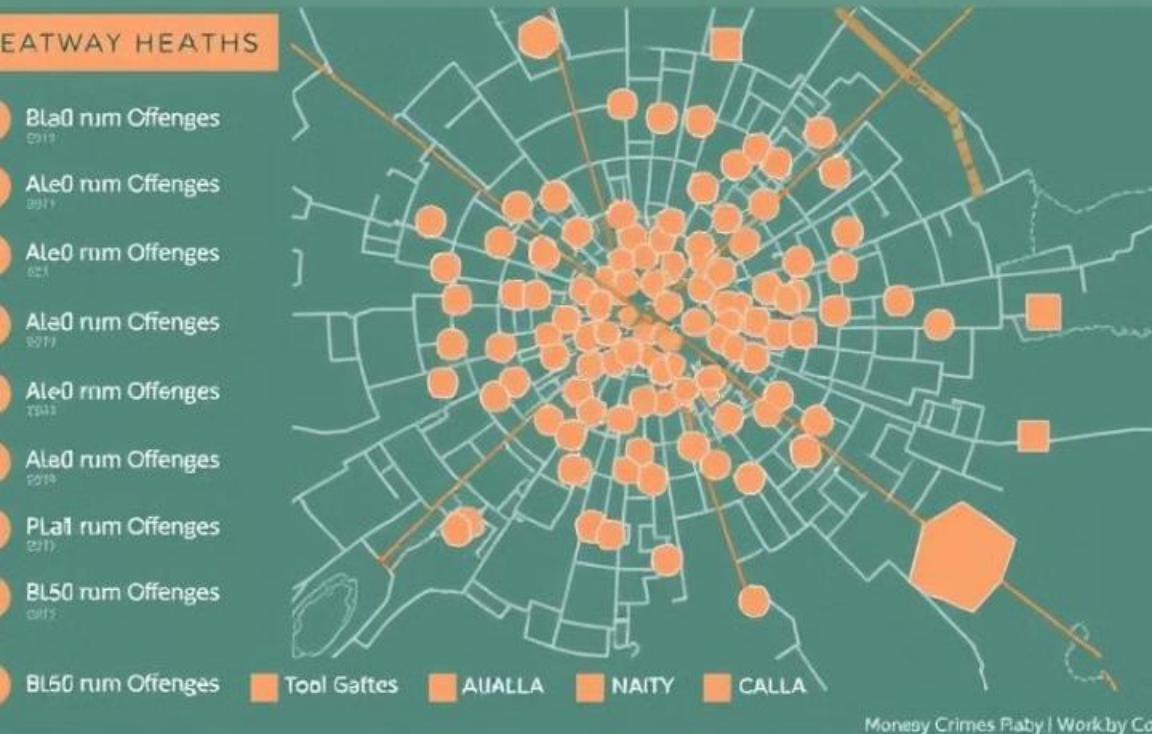


# CRIME RATIOS

Forecasting PltSr | Tyle | Patep Patch Country



## CRIME HOASPT



## Results & Visualizations



Crime Hotspots

Detected in specific regions.



Outliers Identified

Isolated crimes needing investigation.



Visualization

Scatter plots & heatmaps enhance interpretation.

# Challenges & Limitations

## Challenges Faced

- Data Quality Issues - Missing/incomplete records.
- Parameter Sensitivity - Choosing optimal  $\epsilon$  & MinPts.
- Computational Complexity - Processing large datasets efficiently.

## Limitations

- Focuses on spatial clustering only, does not analyze temporal trends.
- Lack of real-time crime data integration.





# Future Enhancements

Predictive Analysis

Integrating Machine Learning.

Real-Time Data

Dynamic Clustering.

Interactive Dashboard

For Law Enforcement.

Hybrid Approach

Combining DBSCAN with Other Techniques.



# Conclusion

1

## Final Takeaways

DBSCAN effectively identifies crime hotspots & outliers.

2

## Crime Visualization

Helps law enforcement in decision-making.

3

## Further Improvements

Can enhance crime prevention strategies.







THANK

YOU !!