

Crime Forecasting and Trend Analysis

FBI Crime Data | Time Series Analytics Capstone Project

1. Cover Page

Title:

Crime Forecasting and Trend Analysis Using FBI Crime Data

Sector:

Public Safety and Law Enforcement Analytics

Team Details:

CID

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Institute / Faculty:

Newton School Of Technology

Data Visualization Capstone Project

2. Executive Summary

Crime poses a significant challenge to public safety agencies due to its dynamic and time-dependent nature. Traditional reactive approaches limit the effectiveness of law enforcement operations and resource planning.

This project analyzes historical FBI crime data to identify temporal trends, seasonal patterns, and spatial concentration of crime incidents. Using structured data cleaning, exploratory analysis, and time series forecasting techniques, the project estimates future monthly crime incidents to support proactive decision-making.

Key insights reveal that crime exhibits strong seasonality, higher frequency during specific hours, and consistent concentration in certain neighborhoods. Forecasting results indicate measurable changes in future crime volume, enabling better planning and deployment strategies.

Based on these findings, the project recommends targeted patrol deployment during peak hours, focused interventions in high-risk areas, and the use of forecast outputs for monthly

and quarterly planning. Overall, the project delivers a practical, data-driven framework to enhance public safety operations and resource efficiency.

3. Sector & Business Context

Sector Overview

The public safety and law enforcement sector relies heavily on timely intelligence to prevent crime and ensure citizen safety. Data-driven policing has become increasingly important in managing limited resources and growing urban complexity.

Current Challenges

- Reactive policing strategies
- Inefficient resource allocation
- Lack of predictive insights
- Rising operational costs

Problem Selection Rationale

This problem was chosen due to the availability of structured crime data and the strong relevance of forecasting and analytics in improving public safety outcomes.

4. Problem Statement & Objectives

Problem Statement

How can historical crime data be analyzed and forecasted to support proactive crime prevention and efficient law enforcement planning?

Project Scope

- Temporal and spatial crime analysis

- Monthly crime forecasting
- Insight-driven recommendations

Success Criteria

- Clear identification of trends and seasonality
 - Accurate aggregation and forecasting
 - Actionable insights for decision-makers
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5. Data Description

Dataset Source:

FBI Crime Data Repository

https://github.com/slayplayagrima/SectionC_Group18_CrimeForcasting.git

Data Structure:

Structured tabular dataset with time and location attributes.

Key Columns:

Crime Type, Date, Hour, Neighborhood, Latitude, Longitude, Year, Month

Data Size:

5000+ records

Limitations:

- No socio-economic variables
 - Reporting inconsistencies
 - Limited contextual data
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6. Data Cleaning & Preparation

- Missing values removed or filtered

- Invalid and duplicate records eliminated
- Date and time standardized
- Feature engineering (Year, Month, Hour)
- Aggregation from daily to monthly level

All primary data preparation was executed in **Google Sheets**, as per capstone requirements.

7. KPI & Metric Framework

KPI	Definition	Why it Matters
Total Crime Incidents	Count of all crimes	Overall crime volume
Monthly Growth Rate	% change MoM	Trend detection
Crime by Type (%)	Category-wise distribution	Focus areas
Peak Crime Hour	Highest incident hour	Patrol planning
High-Risk Areas	Top neighborhoods	Resource allocation
Forecasted Incidents	Predicted monthly count	Proactive planning

KPIs directly map to forecasting, risk identification, and operational efficiency objectives.

8. Exploratory Data Analysis (EDA)

- **Trend Analysis:** Monthly and yearly crime trends
- **Comparison Analysis:** Crime by category and time
- **Distribution Analysis:** Hour-wise and location-wise spread
- **Correlation Analysis:** Time vs incident frequency

Insights were documented alongside charts in Google Sheets.

9. Advanced Analysis

- Time series forecasting of monthly crime incidents
 - Identification of seasonal peaks
 - Detection of high-risk time periods and locations
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10. Dashboard Design

- Built entirely in **Google Sheets**
- Uses pivot tables, formulas, and filters
- Views include KPIs, trends, crime distribution, and forecasts
- Interactive filters for year, crime type, and location

(Screenshots with explanations to be included)

11. Insights Summary

1. Crime shows strong monthly seasonality
 2. Night-time hours record higher incidents
 3. Certain crime types dominate consistently
 4. Specific neighborhoods remain high-risk
 5. Forecasts indicate potential future shifts
 6. Crime volume varies significantly across months
 7. Temporal patterns repeat year-over-year
 8. Forecasting improves planning accuracy
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12. Recommendations

Insight	Recommendation	Impact
Peak crime hours	Increase night patrols	Improved prevention
High-risk areas	Targeted interventions	Resource efficiency
Seasonal spikes	Seasonal safety programs	Reduced incidents
Forecast trends	Use in deployment planning	Proactive control

13. Impact Estimation

- Improved patrol efficiency through targeted deployment
 - Reduced operational waste via forecast-based planning
 - Enhanced public safety during high-risk periods
 - Better strategic planning and risk reduction
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14. Limitations

- Absence of socio-economic variables
 - Assumption of historical trend continuity
 - Forecasts dependent on data quality
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15. Future Scope

- Integration of socio-economic and demographic data
- Advanced forecasting models
- Real-time crime monitoring

- Policy impact analysis
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16. Conclusion

This project demonstrates how historical crime data can be transformed into predictive insights to support proactive law enforcement strategies. By combining structured analysis, forecasting, and visualization, the project delivers measurable decision-making value.

17. Appendix

- Data Dictionary
 - Additional Charts
 - Python logic (if applicable)
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18. Contribution Matrix

Team Member	Dataset & Sourcing	Cleaning	KPI & Analysis	Dashboard	Report Writing	PPT	Overall Role
Polana Rakshita	✓	✓					
Agrima Gusain		✓	✓				
Adil Mirza			✓	✓			
Ujjwal Bharadwaj				✓	✓		
Mishti Sharma					✓	✓	
Sanchit Garh						✓	

Example of the Dashboard



Declaration:

We confirm that the above contribution details are accurate and verifiable through version history and submitted artifacts.

Team Signature Block: _____