CrimeLens

Crime Pattern Prediction and Visualization Platform

Guide :

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*Team Members :*

70 - Rajeev R
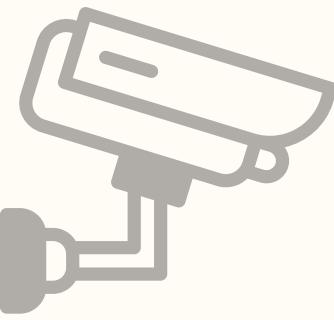
69 - Phoenix Lal P T

61 - Vaisakh V
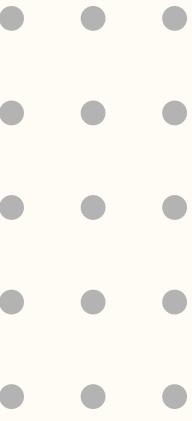
Problem Definition

- **The Data Chasm:** The fundamental issue across many domains, from urban planning to law enforcement, is the vast chasm between acquiring large volumes of raw data and deriving timely, actionable intelligence from it.

- **Complexity Overload:** Traditional, static analytical methods are often overwhelmed by complexity, preventing organizations from making proactive, data-informed decisions.

- **Fragmented Public Safety Tools:** Most existing platforms are reactive, showing only historical data without providing real-time sentiment, 3D spatial depth, or intelligent navigation for citizens.

- **Absence of Actionable Context:** Static maps lack personalized safety advice grounded in local crime patterns, leaving a gap in immediate, context-aware safety guidance.

Objectives

1. Advanced Crime Analysis and Hotspot Detection

Develop an advanced crime analysis platform that identifies hotspots, spatial clusters, and temporal trends using optimized K-means clustering and machine learning techniques. This supports data-driven decision-making for law enforcement and policymakers by pinpointing areas of high crime concentration from filtered historical datasets.

2. High-Performance Geospatial Visualization and Interactive Dashboards

Empower users with high-performance visualization tools, moving from traditional 2D heatmaps to immersive 3D density maps using Hexbin layers and extrusions powered by Deck.gl and MapLibre. These interactive dashboards highlight localized risks and provide a clear visual hierarchy of crime intensity across urban environments.

Objectives

3. AI-Driven Predictive Modeling and Proactive Insights
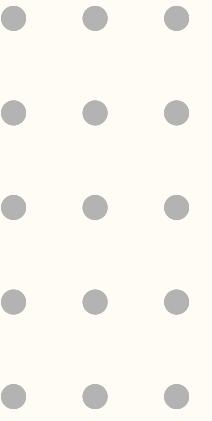
Leverage machine learning to transition from reactive to proactive safety by integrating XGBoost classifiers for severity prediction and Facebook Prophet for 12-month future crime volume forecasting. This enables users to anticipate potential risks and resource needs based on sophisticated temporal and geospatial feature analysis.

4. Conversational Safety Guidance and Real-Time Sentiment Intelligence

Bridge the gap between complex technical data and citizen safety through a conversational AI Safety Assistant powered by Google Gemini that provides context-aware advice. Furthermore, implement a Public Perception Engine that uses NLP to analyze local news headlines, generating a real-time Fear Index to gauge community sentiment.

Objectives
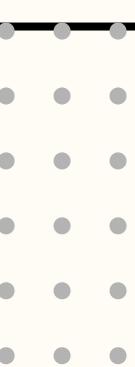
5. Crowdsourced Intelligence and Automated Professional Reporting

Facilitate community engagement through a User Crime Reporting tool that allows crowdsourced incident pins to be dropped directly onto the interactive map. Additionally, streamline administrative workflows with a one-click PDF export system that summarizes findings using AI, providing professional-grade intelligence reports inclusive of maps, trends, and localized risks.

Novelty / Overall Contribution

- **Unified Multi-Source Intelligence Framework** The platform bridges the "data chasm" by integrating disparate data streams—including historical crime records, geospatial coordinates, and qualitative news sentiment—into a single, real-time analytical hub. This prevents data silos and provides a comprehensive view of urban safety.

- **High-Dimensional 3D Geospatial Visualization** Moving beyond traditional flat mapping, the project utilizes 3D Hexbin layers with vertical extrusions. This translates raw crime density into a visual hierarchy of risk, allowing users to intuitively grasp the magnitude and intensity of hotspots through spatial depth.

Novelty / Overall Contribution

- **Hybrid Predictive Analytics Architecture** The system implements a dual-tier modeling stack: XGBoost for event-based severity classification and Facebook Prophet for longitudinal volume forecasting. This enables a shift from reactive incident response to proactive threat anticipation and resource optimization.

- **Socio-Technical Public Safety Ecosystem** The project introduces a human-centric dimension to analytics by aligning objective statistics with subjective community perception via an NLP-powered "Fear Index." This is augmented by generative AI safety guidance to support data-driven decision-making for both citizens and authorities.

Sustainable Development Goals

SDG 11 – Sustainable Cities & Communities
- Improves public safety
- Helps reduce crime impact
- Supports smart city planning

SDG 16 – Peace, Justice & Strong Institutions
- Enables data-driven policing
- Enhances transparency
- Improves law enforcement response

SDG 9 – Industry, Innovation & Infrastructure
- Uses AI and data analytics
- Promotes smart digital infrastructure

Task Distribution

Rajeev R

- Frontend development (React)
- Interactive dashboard UI
- Data visualization (charts, maps)
- 3D geospatial layer implementation
- Dashboard logic

Vaisakh V

- Backend development (FastAPI)
- Crime prediction model (XGBoost)
- API integration
- Time-series forecasting

Phoenix Lal P T

- Backend development (FastAPI)
- Data preprocessing
- API integration
- Sentiment analysis module

Conclusion

CrimeLens represents a strategic evolution in urban safety, transitioning from a foundational analytical framework into an integrated, multi-source intelligence ecosystem. By building upon robust machine learning pipelines, the platform is designed to bridge the gap between raw data and actionable community safety through high-fidelity 3D geospatial visualization and real-time sentiment intelligence. By integrating high-performance mapping technologies and NLP-driven perception analysis, the system moves beyond static metrics to offer a proactive tool for data-informed risk mitigation in modern smart cities.

THANK YOU