
# CrimeLens

Crime Pattern Prediction and Visualization Platform

*Guide :*

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# Objectives

- Identify hotspots, clusters, and recurring crime trends to support law enforcement, researchers, and policy makers.
- Empower communities with visual tools that highlight local risks, promoting proactive safety decisions.
- Transform raw datasets into meaningful charts, heatmaps, and dashboards for easier understanding and decision-making.
- Provide a web-based, containerized platform that works across multiple regions and scales with larger datasets.
- Establish a modular base for future extensions such as machine learning–based risk forecasting.

# PROJECT SCOPE

## Core Components

- Development of a crime data analytics platform for visualization and hotspot detection.
- Implementation of an interactive web dashboard with charts, maps, and filtering tools.
- Integration of backend services for data cleaning, aggregation, and predictive analysis.
- Support for key users: law enforcement agencies, researchers, journalists, and community members.

# PROJECT SCOPE

## Planned Outcomes

- Data upload functionality (CSV crime datasets) with automated preprocessing.
- Hotspot and heatmap generation using clustering and geospatial mapping techniques.
- Time-series and categorical analysis with interactive charts and visual summaries.
- Crime severity classification and risk prediction powered by rule-based logic and machine learning.
- Robust filtering and search capabilities for location, crime type, and time range.
- Containerized deployment with Docker Compose for easy scalability and reproducibility.

# FEASIBILITY ANALYSIS

## Technical Feasibility

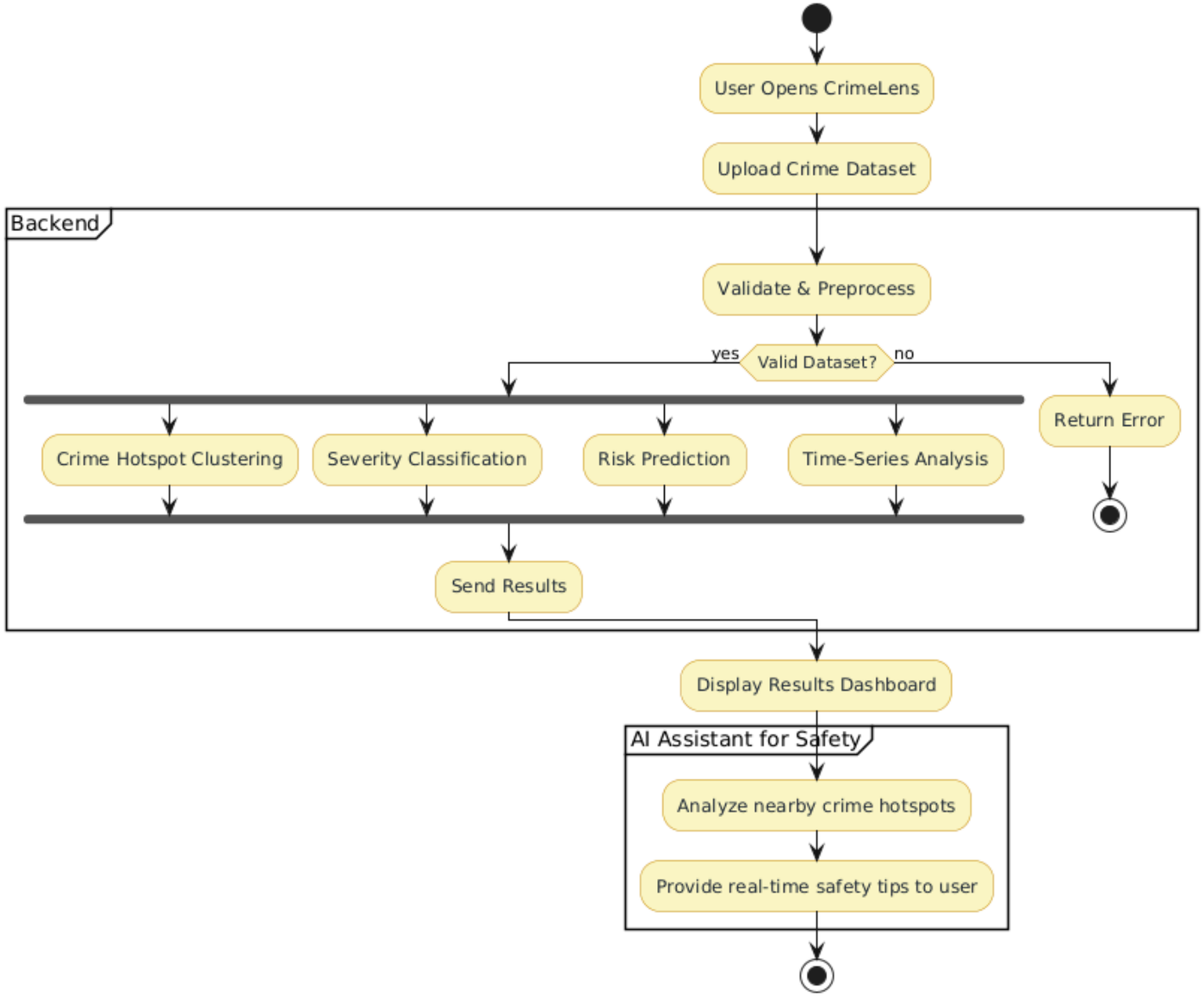
- **Data Upload & Ingestion –** CSV upload via React/Streamlit and API integration ensures seamless handling of structured datasets.
- **Crime Hotspot Detection –** Clustering algorithms (DBSCAN) on latitude/longitude effectively identify high-crime regions.
- **Heatmap Visualization –** Folium + HeatMap plugins render geographic intensity maps for intuitive hotspot recognition.
- **Time-Series Trend Analysis –** Forecasting libraries (Prophet) enable tracking and predicting crime counts over time.
- **Crime Severity Classification –** Rule-based or ML models (e.g., XGBoost) categorize incidents into Low, Medium, or High severity.

# FEASIBILITY ANALYSIS

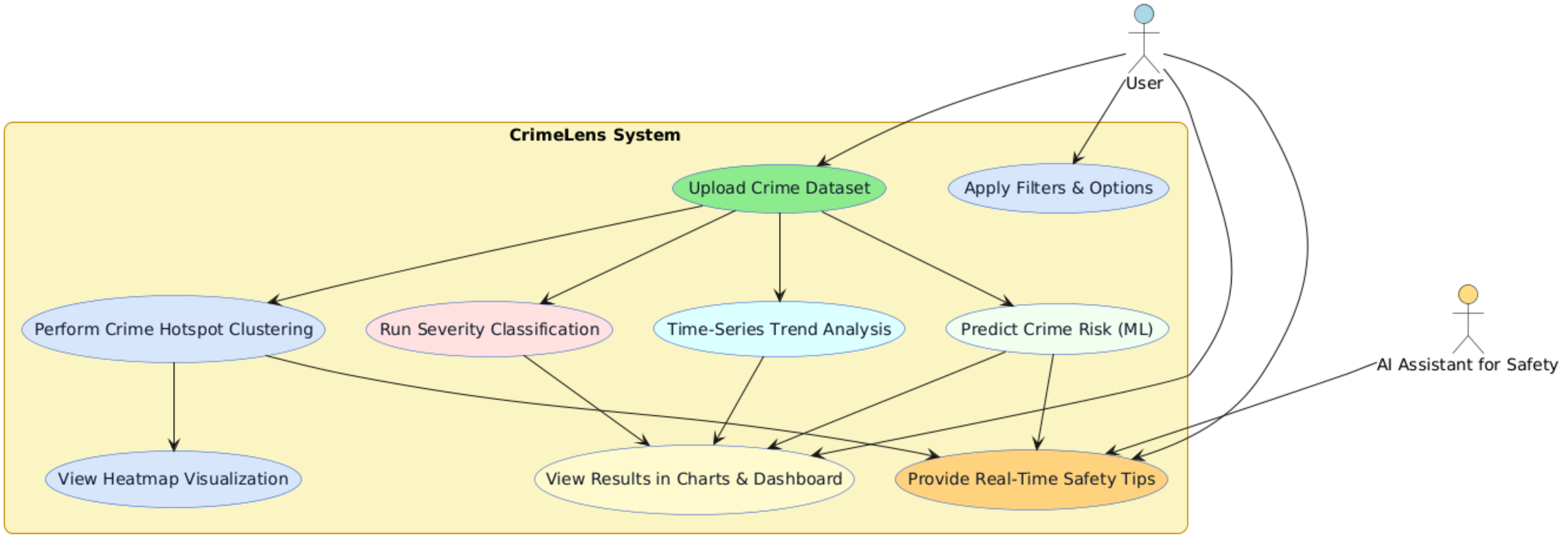
## Technical Feasibility

- **Crime Risk Prediction –** Predictive ML models (XGBoost, gradient boosting) estimate high-risk areas using spatiotemporal features.
- **Area Search & Filtering –** Efficient string-matching and location-based queries allow users to drill down into specific cities, zones, or crime types.
- **AI Assistant for Safety –** Conversational AI (Gemini API or similar) provides real-time safety tips, integrated into the dashboard as a chatbot.
- **Interactive Dashboard –** React + Plotly + Leaflet ensure responsive, modern visualization through charts, filters, and dynamic maps.
- **Deployment & Scaling –** Containerized with Docker and orchestrated with Docker Compose, ensuring portability, scalability, and ease of setup.

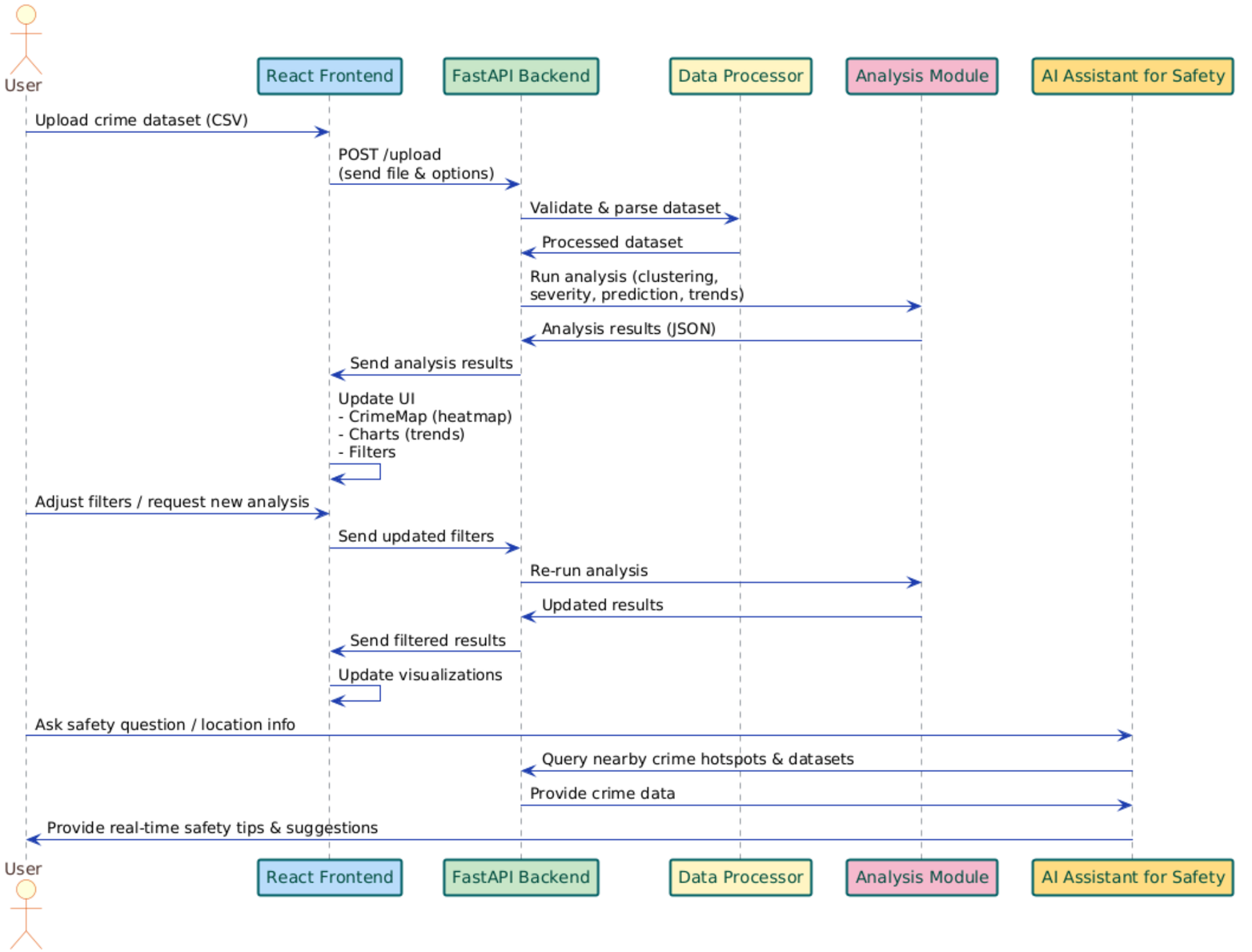
# Activity Diagram



# Use Case Diagram



# Sequence Diagram



# LITERATURE SURVEY

| SI NO | REFERENCE | FEATURES / KEY FINDINGS |
|---|---|---|
| 1 | Ilgün, E. G., & Dener, M. (2025). Exploratory data analysis, time series analysis, crime type prediction, and trend forecasting in crime data using machine learning, deep learning, and statistical methods . Neural Computing and Applications, 37, 11773–11798. | • Studied datasets from Chicago, San Francisco, Philadelphia.<br>• Compared ML (XGBoost, CatBoost, RF), DL (LSTM, BLSTM), and statistical models (SARIMA, Prophet).<br>• XGBoost showed highest accuracy in classification.<br>• LSTM performed best in long-term forecasting.<br>• Predicted crime trends 5 years ahead for preventive policing. |
| 2 | Balaji, G., & Kokila, G. (2025). Crime Hotspot Classification using Machine Learning. In 2025 International Conference on Machine Learning and Autonomous Systems (ICMLAS) (pp. 220-228). IEEE. | • Used classification models (KNN, SVM, Random Forest) on crime datasets.<br>• KNN achieved 97% accuracy in hotspot classification.<br>• Showed that spatial-temporal data is highly effective for hotspot prediction. |

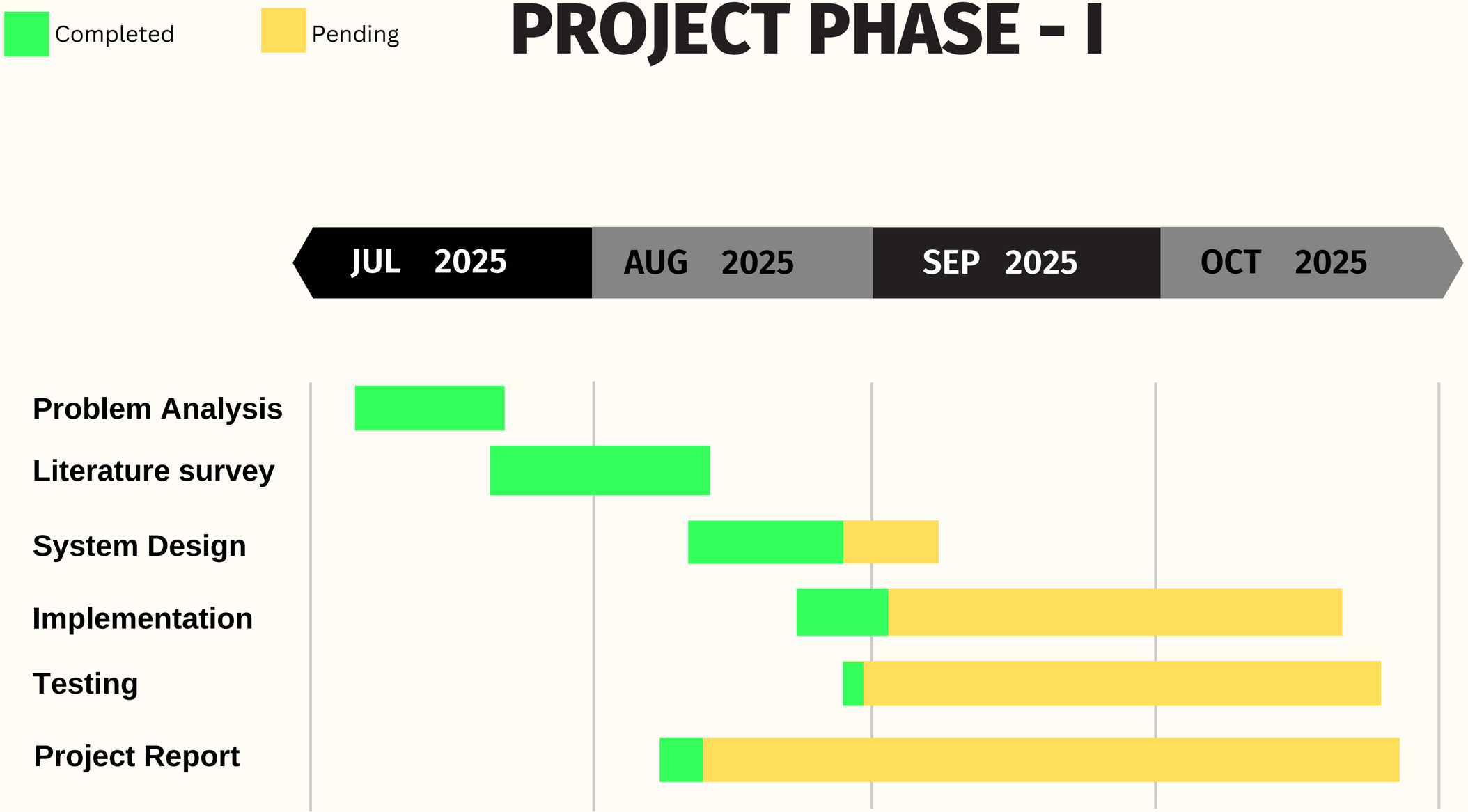
# LITERATURE SURVEY

| SI NO | REFERENCE | FEATURES / KEY FINDINGS |
|---|---|---|
| 3 | Cesario, E., Lindia, P., & Vinci, A. (2024). Multi-density crime predictor: An approach to forecast criminal activities in multi-density crime hotspots. Journal of Big Data, 11(75). https://doi.org/10.1186/s40537-024-00935-4 | • Introduced multi-density clustering to identify different hotspot levels.<br>• Combined SARIMA and LSTM for spatio-temporal forecasting.<br>• Evaluated on 2M+ Chicago crime records (19 years).<br>• Outperformed baseline ML and DL models in hotspot forecasting accuracy. |
| 4 | Shah, N., Bhagat, N. & Shah, M. Crime forecasting: a machine learning and computer vision approach to crime prediction and prevention. Vis. Comput. Ind. Biomed. | • Combined ML + computer vision approaches for real-time crime prevention.<br>• Applied to face recognition, license plate recognition, CCTV, drone surveillance.<br>• Demonstrated potential for AI-driven predictive policing and public safety applications. |

# LITERATURE SURVEY

| SI NO | REFERENCE | FEATURES / KEY FINDINGS |
|---|---|---|
| 5 | Wu, J., Abrar, S. M., Awasthi, N., Frias-Martinez, E., & Frias-Martinez, V. (2022). Enhancing short-term crime prediction with human mobility flows and deep learning architectures. EPJ Data Science, 11(1), 53. | • Integrates human mobility flows (GPS, Foursquare, CDR) with crime prediction.<br>• CNN & LSTM outperformed regression models with +7% F1-score.<br>• Proved mobility patterns are strong predictors of urban crime. |
| 6 | Bonam, J., Narendra, K., Burra, L. R., & Sandeep, M. (2023). Crime Hotspot Detection using Optimized K-means Clustering and Machine Learning Techniques. In 2023 4th International Conference on Electronics and Sustainable Communication Systems (ICESC) (pp. 787-792). IEEE. | • Applied Elbow Method + K-means clustering for hotspot detection.<br>• Classification models (Decision Tree, SVM, RF) further refined predictions.<br>• Achieved 89% accuracy with Random Forest.<br>• Demonstrated framework applicability for Indian crime datasets. |

# PROJECT PHASE - I



# Conclusion

- The CrimeLens platform empowers communities, researchers, and law enforcement agencies to better understand and respond to crime patterns. Through interactive dashboards, heatmaps, and trend analysis, it transforms raw datasets into actionable insights that support decision-making and public safety.
- By combining geospatial visualization, predictive analytics, and scalable deployment, CrimeLens enhances crime prevention strategies and fosters data-driven governance. Optional AI assistants further make the platform more intuitive and inclusive, ensuring accessibility for both professionals and the public.

# THANK YOU