AI Powered Crime Pattern Analysis System

Developed For

(Isquareinfotech,Rajkot.)

Report Part- I (Sem – V)
Submitted For
The Partial Fulfillment Towards
TheDegreeof

Bachelor of Computer Applications (BCA) Hons.

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Under the Guidance of

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iSquare INFOTECH

332, Backbone Shopping centre,
Mayani Chowk,
Chandreshnagar Main Road
Rajkot - 360004

Date: 22/09/2025

This is to certify that **Mr. Zeel Sorathiya, Mrs. Devki Prajapati,** and **Mrs. Shah Aayushi** are students of the BCA (Hons) programme at FCAIT, GLS University, Ahmedabad, and have been mentored by us.

They have successfully completed the first phase of their Software Development Project (Capstone) titled “AI-Powered Crime Pattern Analysis System.”

During this phase, they accomplished the following tasks under our guidance:

- System Analysis
- UML Diagrams
- Data Dictionary
- Initial Screen Layouts

Throughout this phase, we found them to be sincere, hardworking, and dedicated in achieving their milestones.

Ishu Suvagia

Founder & CEO

GLS UNIVERSITY
Faculty of Computer Applications & Information Technology
BCA Hons. Programme
Ahmedabad

CERTIFICATE

This is to certify that
1) Zeel Sorathiya
2) Devki Prajapati
3) Aayushi Shah

Student/s of Semester- V BCA(Hons.), FCAIT, GLS University has/have successfully completed the System Development Project Part-I, System Analysis work on " AI Powered Crime Pattern Analysis System" as a partial fulfillment of the study of Third year Semester-V, Bachelor of Computer Applications(BCA) Honours.

Date of Submission: 04-12-2025

Prof. Neha Samsir
Project Guide

Ravi Ribadiya
Project Co-Ordinator

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to **Prof. Neha Samsir** our internal guide, for her continuous guidance, support, and encouragement throughout the development of our Capstone Project. We also extend our heartfelt thanks to our **external guide Ravi Ribadiya** for providing valuable insights and advice that greatly helped us in completing this project successfully.

We are also thankful to all our faculty members at GLS University for providing us with the knowledge and skills essential for this project. Lastly, we truly enjoyed working together as a team on this project, and the experience of collaboration, learning, and mutual support made this journey both rewarding and enjoyable.

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Company Profile

- Isquare Infotech is a growing IT company that provides smart and simple technology solutions for different kinds of businesses. The company mainly works on web and software development, focusing on building applications that are easy to use and solve real-life problems. With a dedicated team of professionals, Isquare Infotech believes in working closely with clients, understanding their needs, and delivering projects on time with good quality. The company also keeps learning and adapting to new technologies so that it can provide modern and reliable solutions. Because of this approach, Isquare Infotech has become a trusted name for students, professionals, and organizations who want effective and affordable IT services.

Ishu Suvagia

Founder & CEO

Project Profile

Title - AI-Powered Crime Pattern Analysis System.

Objective -

The objective of this project is to design and implement a web-based system that enables law enforcement agencies and organizations to record, manage, and analyze crime data efficiently. The system uses Artificial Intelligence (AI) to identify crime patterns and hotspot areas, helping authorities in decision-making and crime prevention strategies.

Project Description -

1. The **AI-Powered Crime Pattern Analysis System** is a web application designed to store and analyze crime records. It provides both data entry police and administrative controls (for authorized admins) to ensure the data is reliable and useful.
2. The system enables **Police** to submit crime details such as crime type, location, date, and time through a user-friendly web form. Data is stored in a **MySQL database** with validation to avoid duplicate entries.
3. The **Admin module** ensures secure login and provides functionalities to view, edit, or delete crime reports. Admins can also trigger the AI/ML module to analyze stored data.
4. The **AI/ML module** uses Python (Scikit-learn's KMeans algorithm) to identify clusters of crimes based on location. The output is visualized as a map or chart highlighting **crime hotspot areas**, which are displayed dynamically in the system.
5. The **integration of Java Servlets (backend)** and **Python AI scripts** ensures real-time communication between the web application and the AI analysis engine.
6. The system provides a **visual decision-support tool** that helps authorities identify high-crime zones, allocate resources efficiently, and take preventive actions.

Project Module -

1. User Module:

The User Module allows data entry operators or general users to submit crime-related information into the system. Users can easily fill out a web form specifying the type of crime, location, date, and time of the incident. Once submitted, the system validates the data through Java Servlets and stores it securely in the MySQL database. Duplicate entries are prevented automatically to maintain the integrity of the records.
From a workflow perspective, the user opens the Crime Entry Page, inputs the required details, and clicks the submit button. The system confirms successful data entry, providing a smooth and responsive user experience.

2. Admin Module:

- The Admin Module is designed to provide authorized administrators with control over the crime database and AI-powered analysis. Administrators log in securely using a username and password verified against the MySQL database.
- Within the dashboard, admins can view all crime reports in a tabular format, edit incorrect records, and delete outdated or invalid entries. They also have the option to trigger the AI/ML Analysis Module to generate insights such as crime hotspots. The workflow ensures that the admin can manage data efficiently while maintaining a secure environment for sensitive information.

3. AI/ML Analysis Module:

- The AI/ML Analysis Module performs automated analysis of the stored crime records to detect patterns and identify hotspots. It fetches crime data from the database and applies a Python-based KMeans clustering algorithm. The results are visualized in the form of maps or charts, highlighting regions with higher crime concentrations.
- The output of the AI analysis is stored on the server and displayed on the Analysis Page of the application. Administrators can simply click the "Run Analysis" button from the dashboard to initiate this process. This module brings intelligence to the system, enabling decision-makers to act on data-driven insights.

Tools and Technologies used

1. **Frontend (Police&AdminWebApplication)**
   - Technologies: HTML, CSS
   - Purpose: Data entry forms, dashboards, and visualization interfaces

2. **Backend**
   - Technologies: Java Servlets, JDBC
   - Purpose: Business logic, form validation, database communication

3. **Database**
   - Technology: MySQL
   - Purpose: Store crime data, user credentials, and analysis results

4. **AI/ML Module**
   - Technology: Python, Scikit-learn (KMeans Clustering)
   - Purpose: Perform clustering of crime records to detect hotspots

5. **Visualization**
   - Output: Hotspot maps/charts generated by AI, displayed in web interface.

Future Scope –

- Integration with GIS (Geographic Information System) for advanced crime mapping.
- Implementation of predictive models to forecast future crime trends.
- Expansion to a mobile application for quick data entry by police officers in the field.
- Real-time integration with CCTV feeds and IoT devices for proactive monitoring.

UML Diagrams

1. Use-Case Diagram:

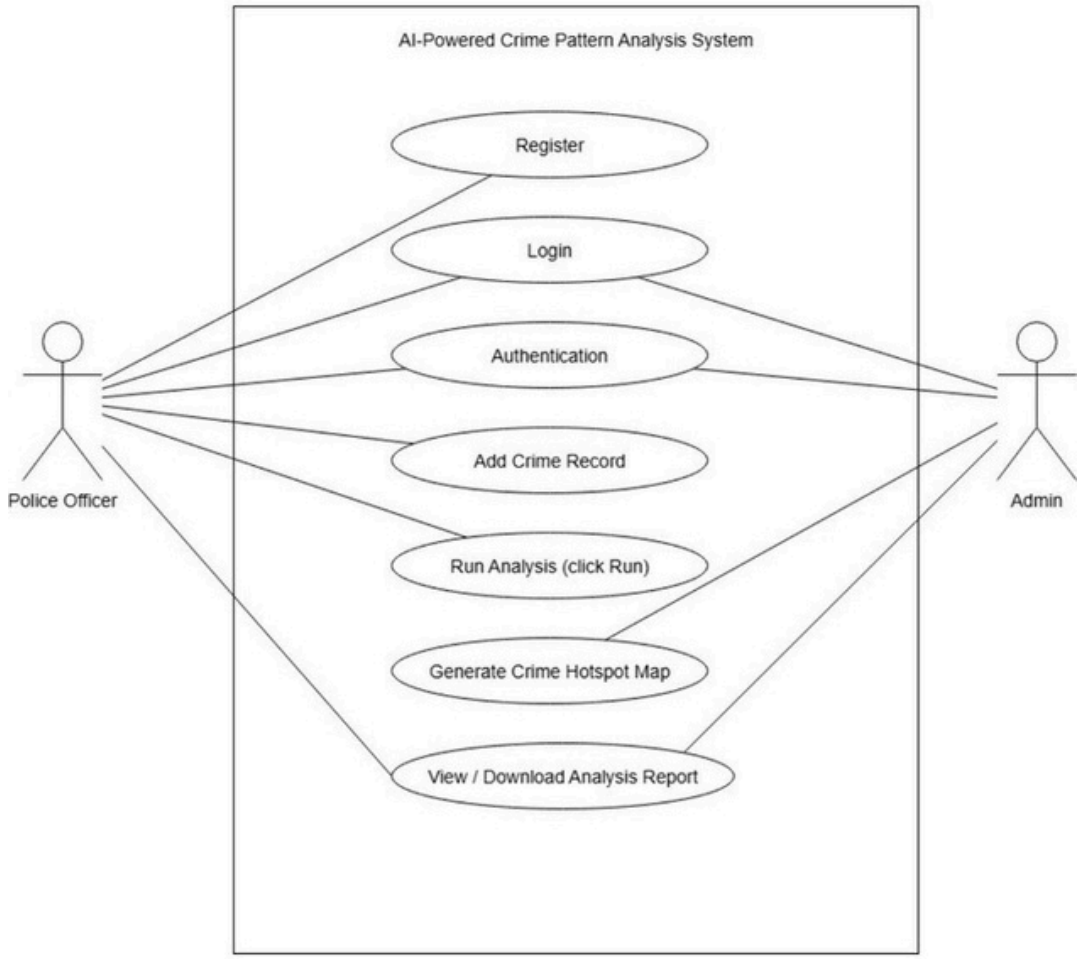
- The Use-Case diagram captures functional requirements and user interactions with the system. A Police Officer opens the crime entry page and submits details like crime type, location, date, and time. An **Admin** logs in securely, checks all crime reports, can edit or delete wrong entries, and can start AI analysis. When the **Admin runs analysis**, the **AI/ML module** processes data and shows a map/chart of hotspot areas.

Actors:

- Police
- Admin

Use- Cases:

- Register
- Login
- Authentication
- Add crime Record
- Run crime Analysis
- Generate Hotspot Map
- View Analysis Report

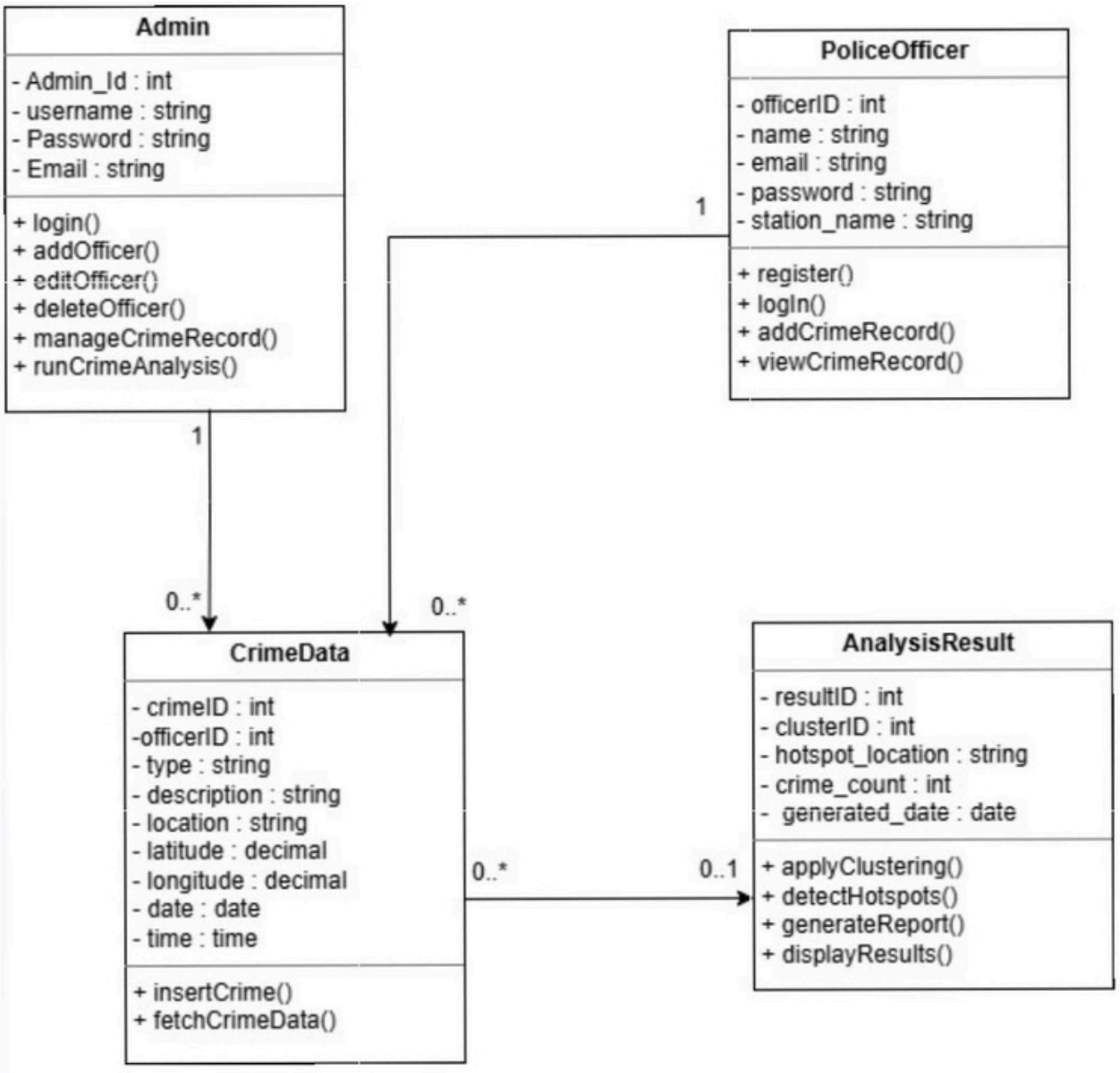

AI-Powered Crime Pattern Analysis System
Register
Login
Authentication
Add Crime Record
Run Analysis (click Run)
Generate Crime Hotspot Map
View / Download Analysis Report
Police Officer
Admin

2. Class Diagram

- The Class Diagram shows the main classes of the system, their data, and how they are connected.

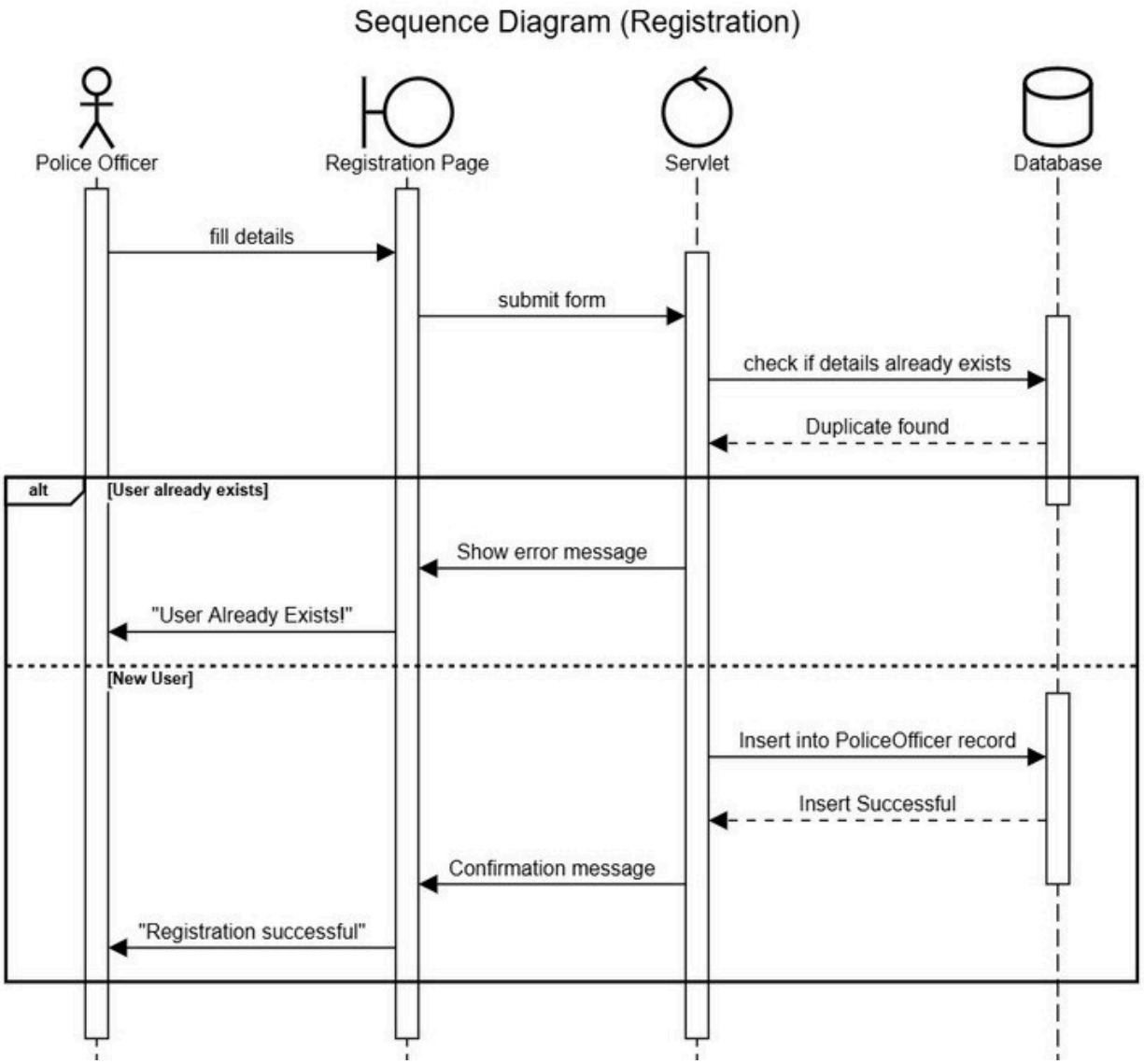
Classes:

1. Police Officer
2. Admin
3. Crime Date
4. Analysis Result

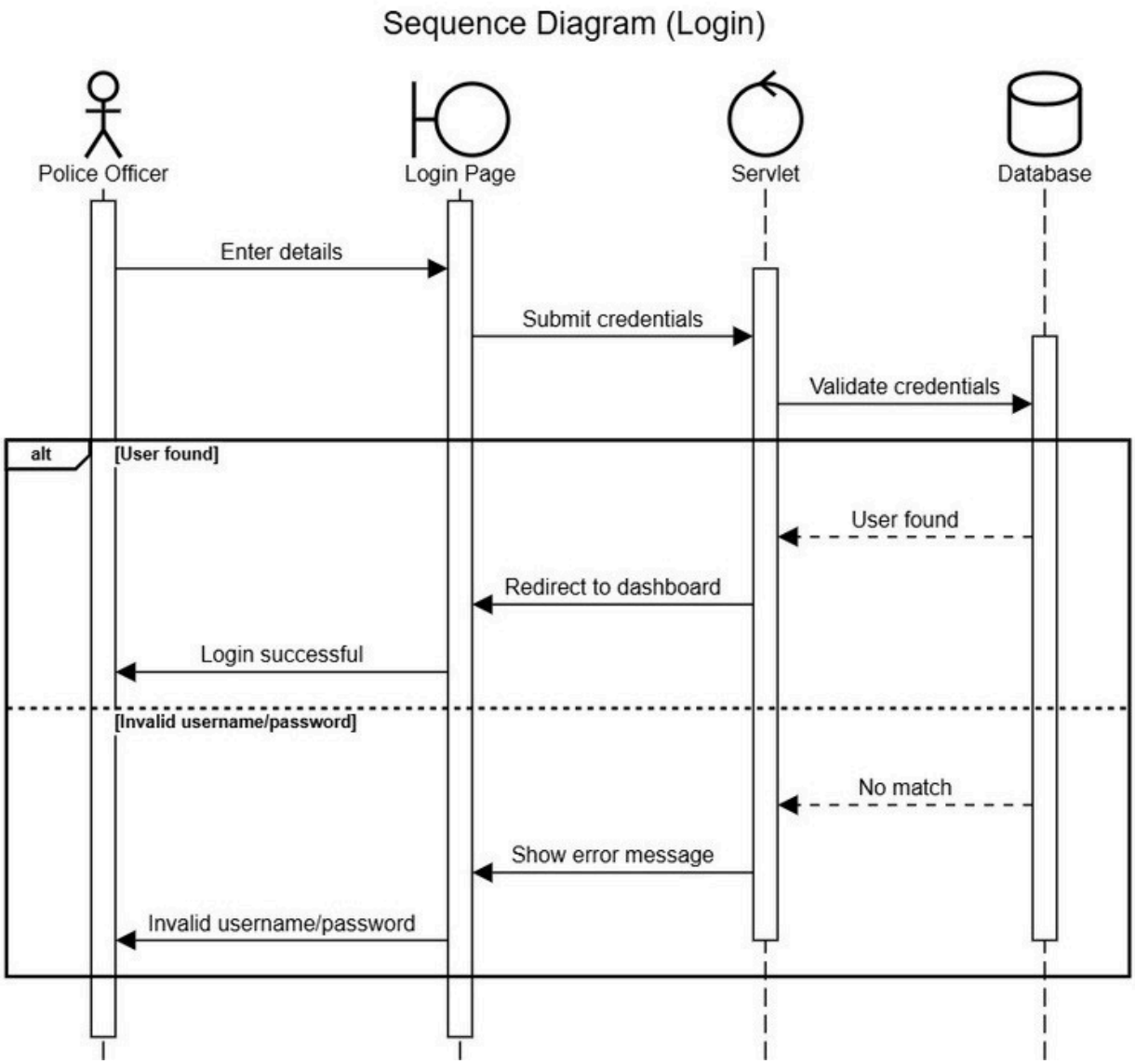

Admin
- Admin_Id : int
- username : string
- Password : string
- Email : string
+ login()
+ addOfficer()
+ editOfficer()
+ deleteOfficer()
+ manageCrimeRecord()
+ runCrimeAnalysis()
PoliceOfficer
- officerID : int
- name : string
- email : string
- password : string
- station_name : string
+ register()
+ logIn()
+ addCrimeRecord()
+ viewCrimeRecord()
1
1
0..*
0..*
CrimeData
- crimeID : int
-officerID : int
- type : string
- description : string
- location : string
- latitude : decimal
- longitude : decimal
- date : date
- time : time
+ insertCrime()
+ fetchCrimeData()
0..*
0..1
AnalysisResult
- resultID : int
- clusterID : int
- hotspot_location : string
- crime_count : int
- generated_date : date
+ applyClustering()
+ detectHotspots()
+ generateReport()
+ displayResults()

3. Sequence Diagrams

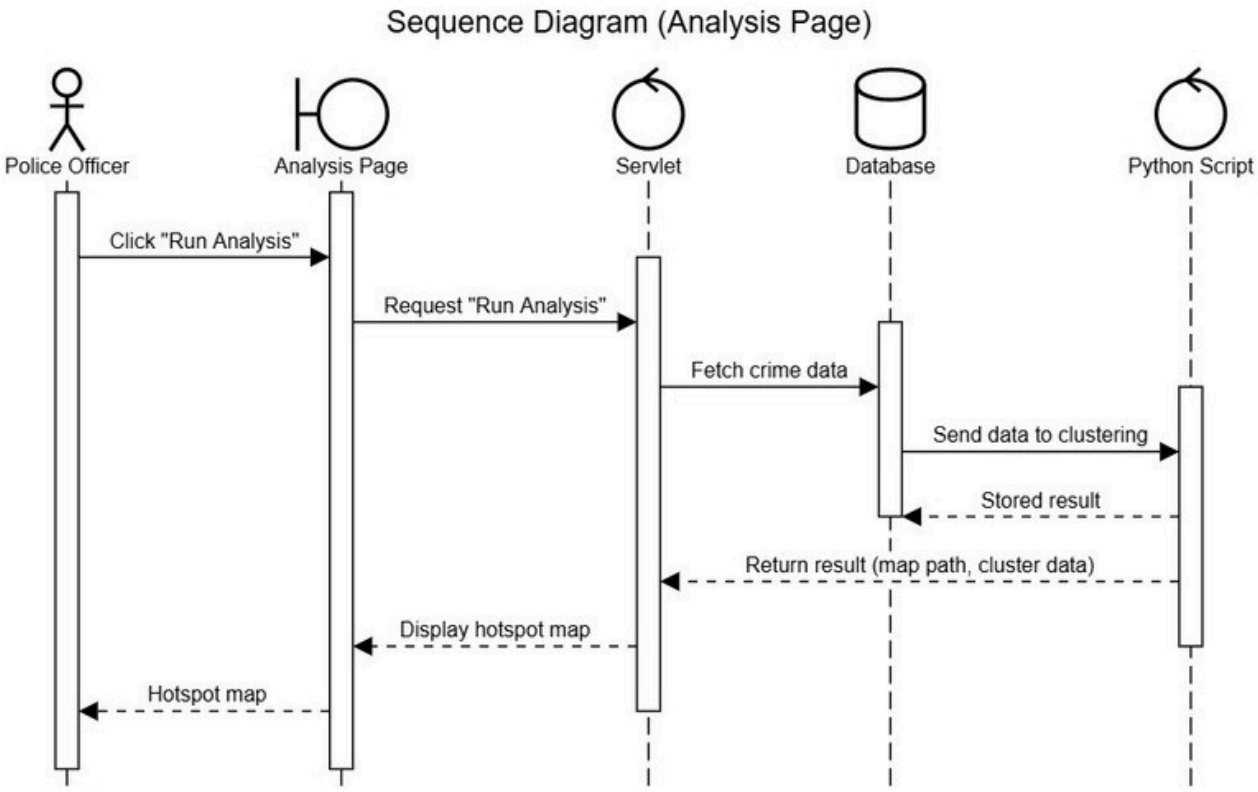
1.Registration Page



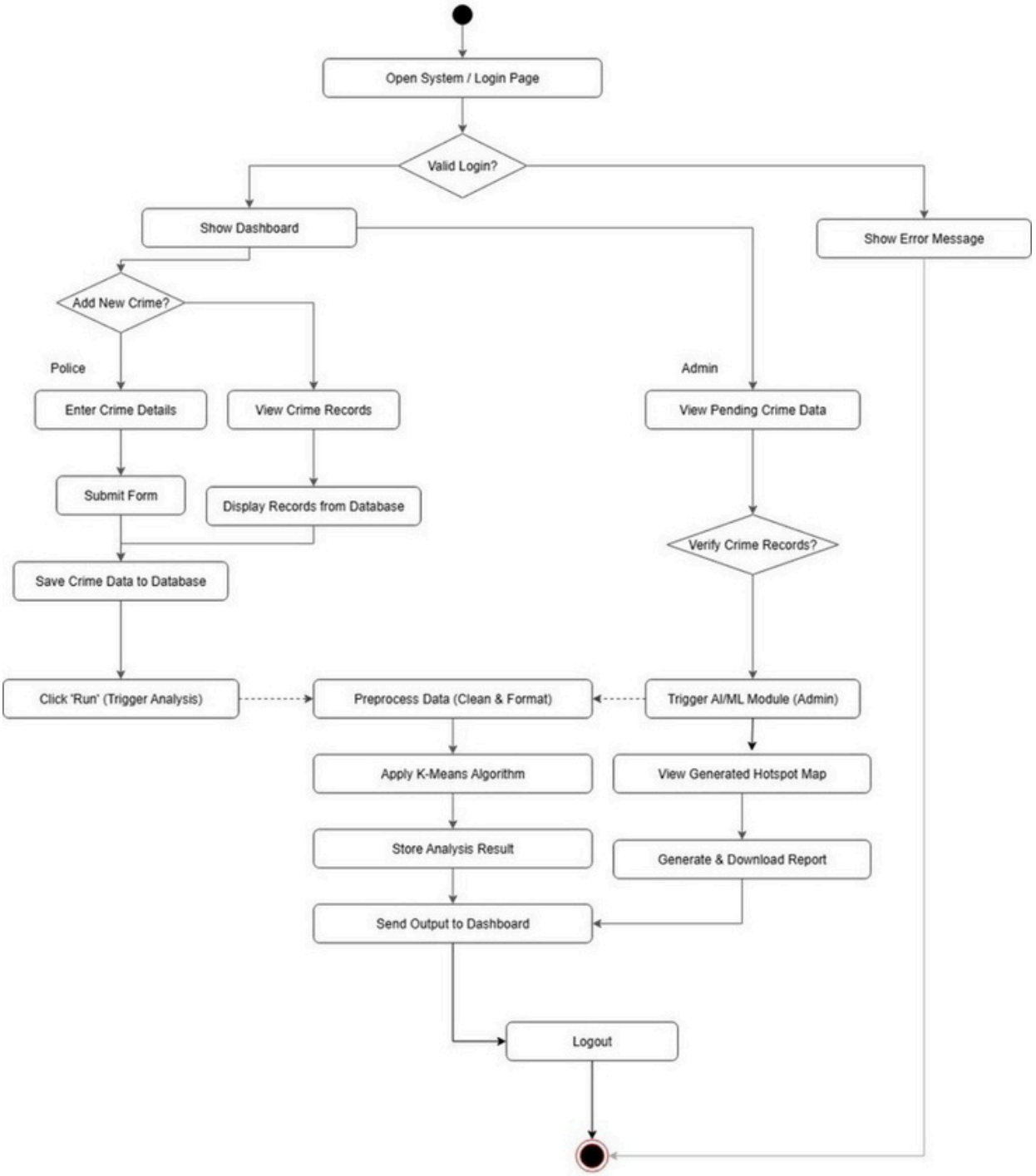
2. Login Page


Sequence Diagram (Login)
Police Officer
Login Page
Servlet
Database
Enter details
Submit credentials
Validate credentials
alt
[User found]
User found
Redirect to dashboard
Login successful
[Invalid username/password]
No match
Show error message
Invalid username/password

3. Analysis Page

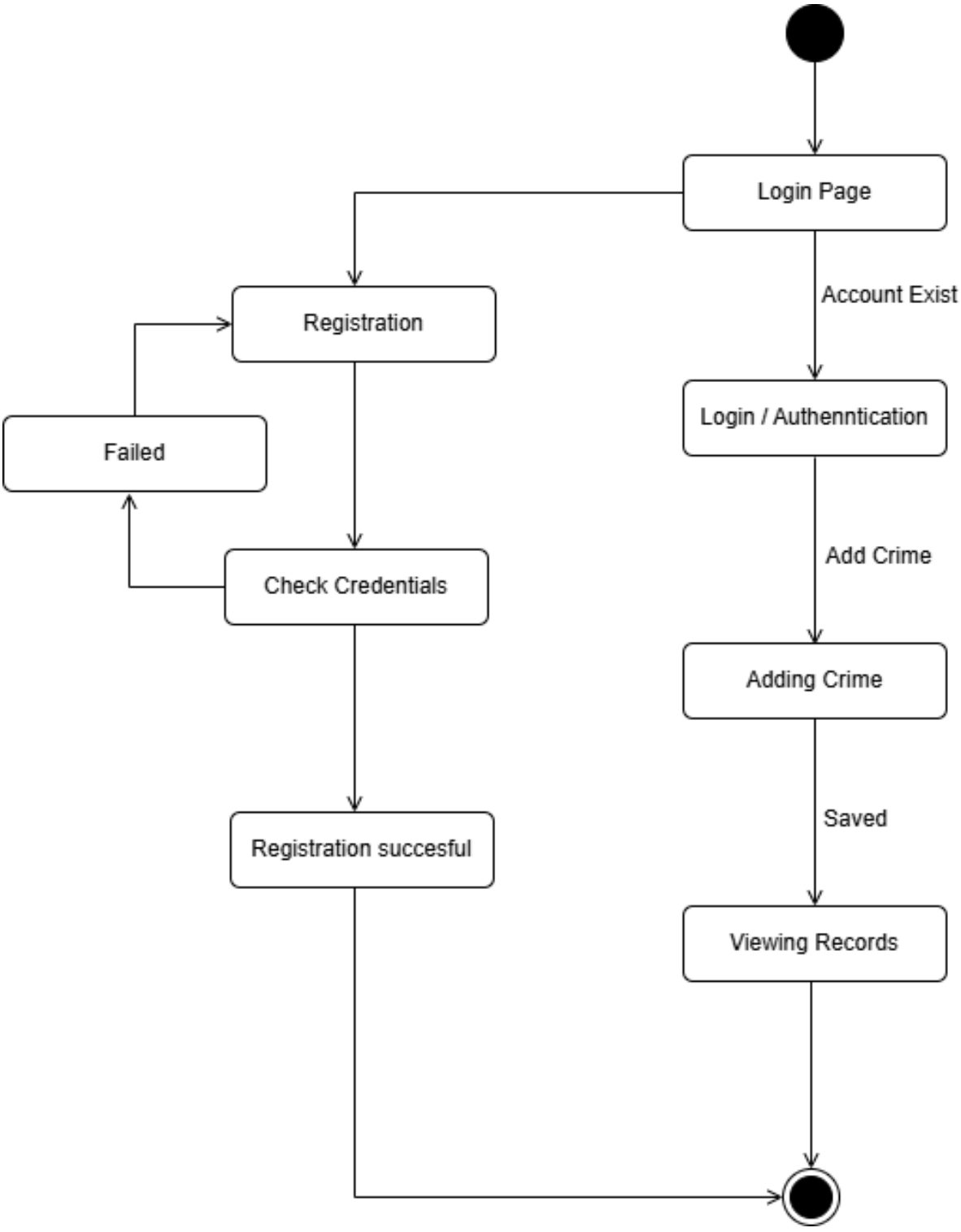


4. Activity Diagram

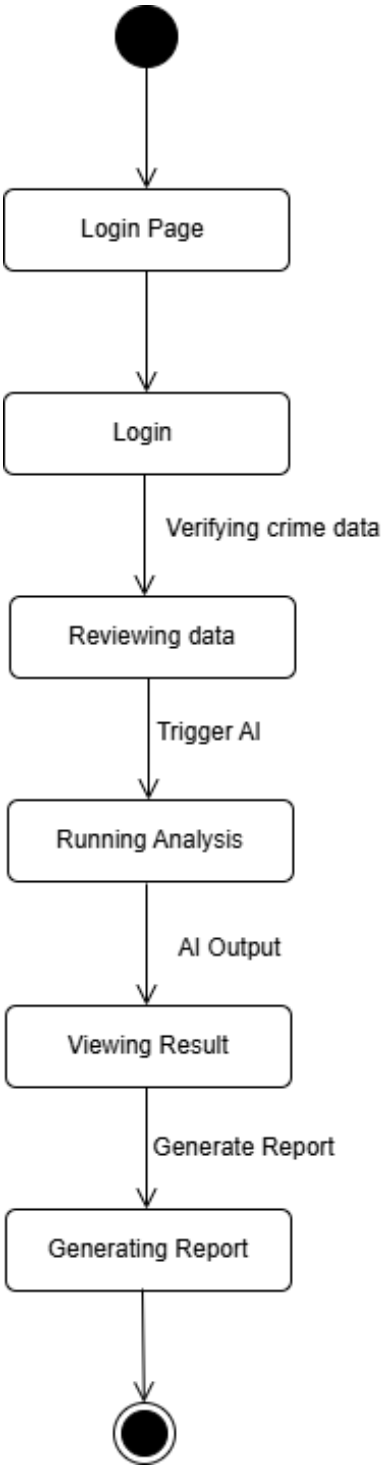


5. State chart Diagram

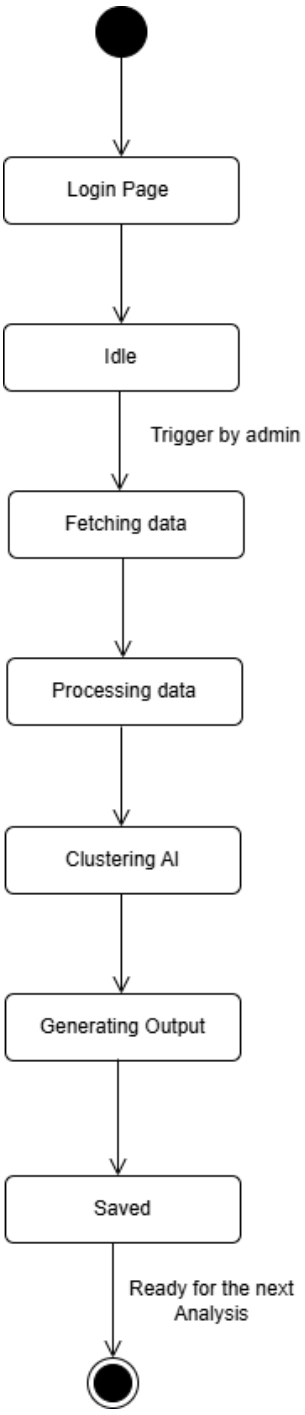
1. User Module



2. Admin Module



3. AI/ML Module



Data Dictionary

1. Police Officer Table

Field Name	Data Type	Field Length	Constraints	Description
officer_ID	INT	10	Primary Key	Unique identifier for police officer
officer_name	VARCHAR	50	NOT NULL	Full name of police officer
password	VARCHAR	255	NOT NULL	Login password
role	VARCHAR	20	CHECK('officer','admin')	Officer role
email	VARCHAR	100	UNIQUE, NOT NULL	Officer's email
phone_number	VARCHAR	15	Optional	Contact number
badge_number	VARCHAR	30	UNIQUE, NOT NULL	Unique badge
station	VARCHAR	100	NOT NULL	Police station
created_at	DATETIME	–	DEFAULT CURRENT_TIMESTAMP	Date of registration

2. Authentication Table

Field Name	Data Type	Field Length	Constraints	Description
auth_id	INT	10	Primary Key	Unique Identifier
police_id	INT	10	Foreign Key	Linked police officer
login_time	DATETIME	–	NOT NULL	Login timestamp
logout_time	DATETIME	–	Nullable	Logout timestamp
status	VARCHAR	20	CHECK('success','fail')	Authentication status (success/fail)

3. Crime Record Table

Field Name	Data Type	Field Length	Constraints	Description
crime_id	INT	10	Primary Key, Auto Increment	Unique Identifier
officer_id	INT	10	Foreign Key	Officer who added record
crime_type	VARCHAR	50	NOT NULL	Types of crime (Theft, Assault, etc)
description	TEXT	-	Optional	Detailed description
location	VARCHAR	200	NOT NULL	Crime location
date_time	DATETIME	-	NOT NULL	Date and time of incident
status	VARCHAR	20	DEFAULT 'open'	Case status (open, closed, pending)
latitude	DECIMAL	9,6	NULL	Latitude mapping for analysis
longitude	DECIMAL	9,6	NULL	Longitude mapping for analysis

4. Crime Analysis Table

Field Name	Data Type	Field Length	Constraints	Description
analysis_id	INT	10	Primary Key, Auto Increment	Unique identifier
run_by	INT	10	Foreign Key	User who ran analysis
analysis_date	DATETIME	–	NOT NULL	Date of analysis
result_summary	TEXT	–	Optional	Brief result description
run_date	DATETIME	–	DEFAULT CURRENT_TIMESTAMP	When the analysis was executed
file_path	VARCHAR	255	NULL	Path of generated hotspot map images

5. Hotspot Map Table

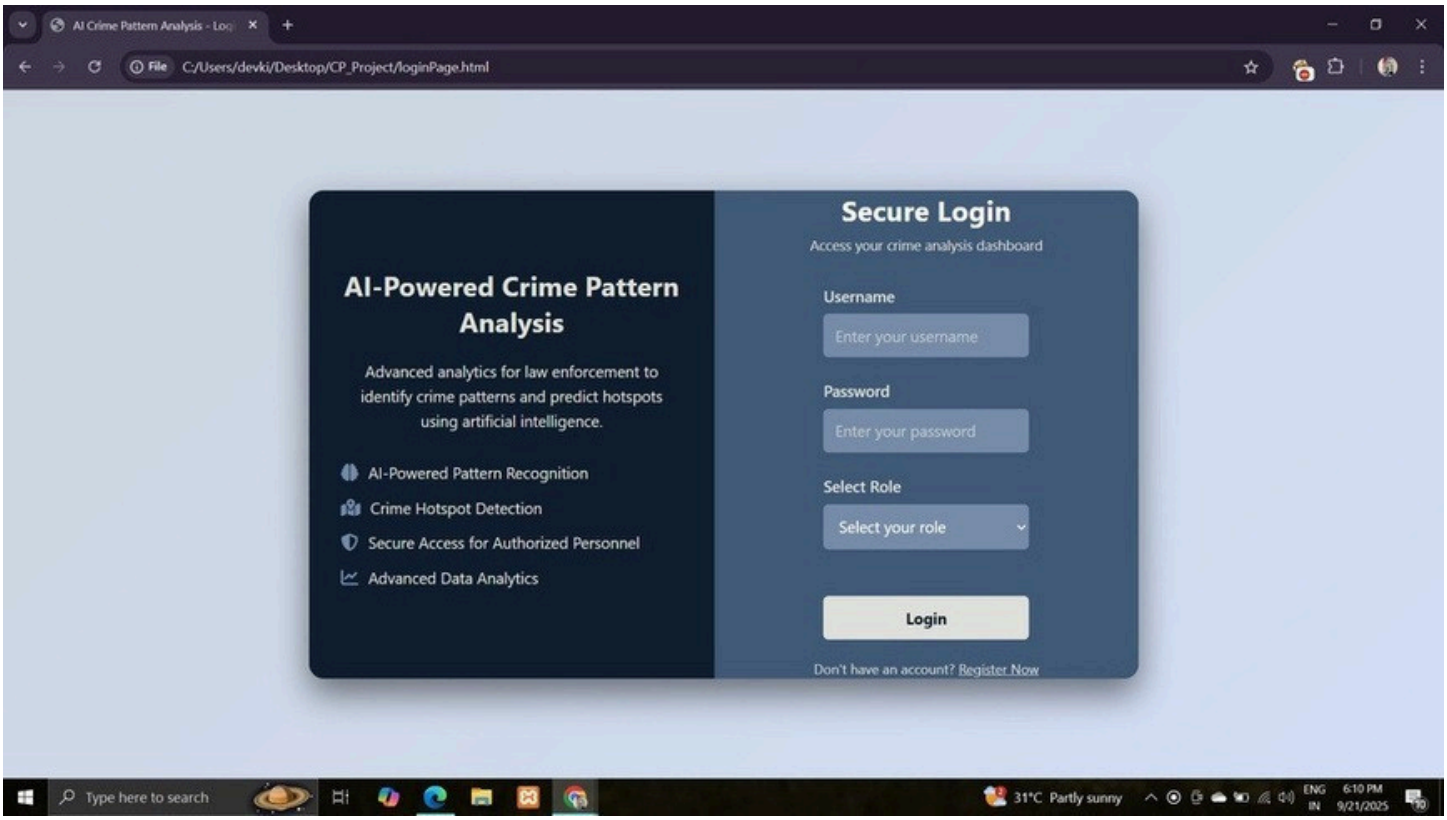
Field Name	Data Type	Field Length	Constraints	Description
map_id	INT	100	Primary Key, Auto Increment	Unique identifier
generated_by	INT	10	Foreign Key	User who generated map
generated_date	DATETIME	–	NOT NULL	Date when map was created
region	VARCHAR	100	NOT NULL	Geographic region of hotspot
heatmap_date	TEXT	–	Optional	Stored map date

6. Analysis Reports Table

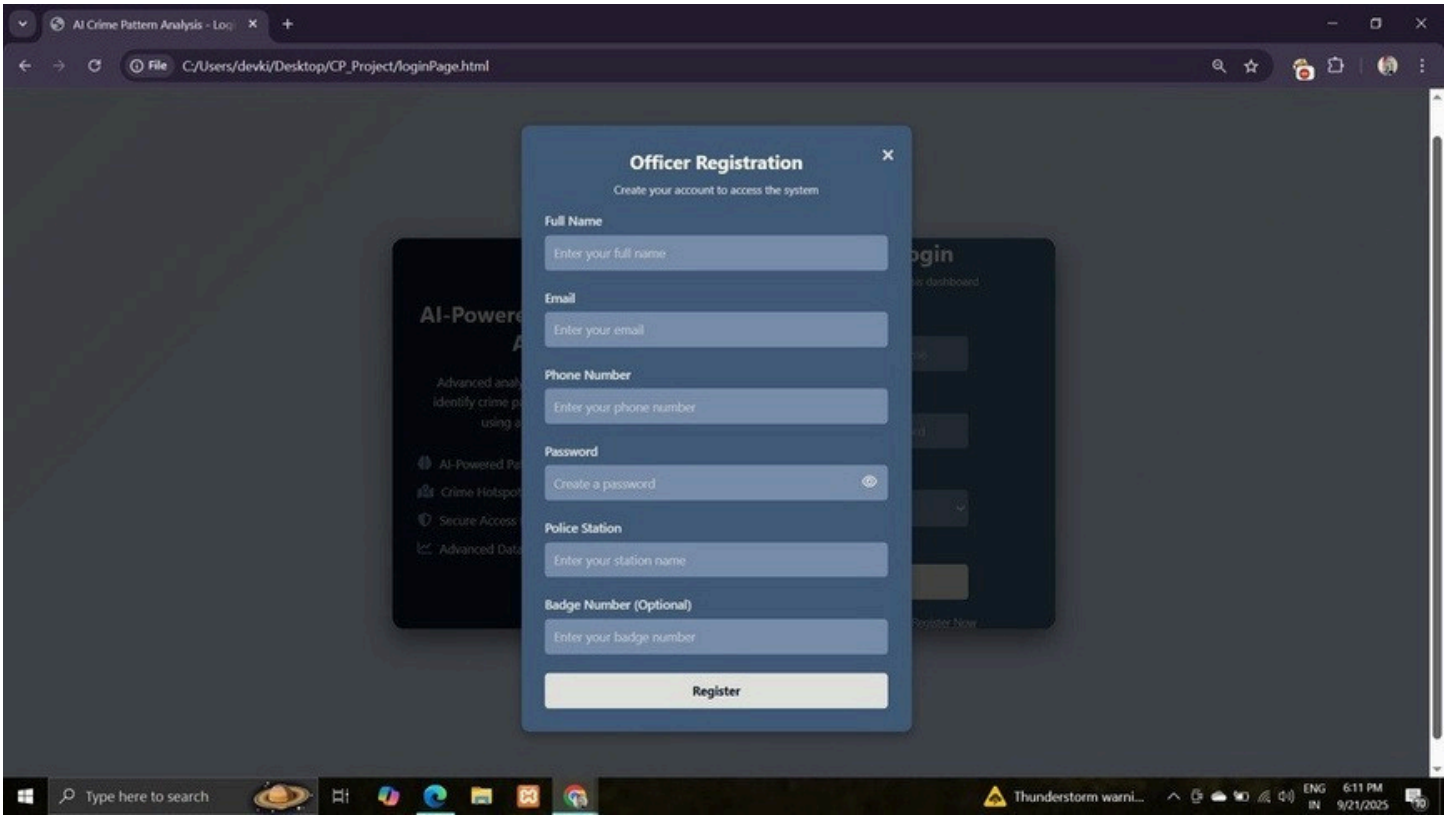
Field Name	Data Type	Field Length	Constraints	Description
report_id	INT	10	Primary Key, Auto Increment	Unique Identifier
generated_by	INT	10	Foreign Key	User who generated report
report_date	DATETIME	–	NOT NULL	Date of report generation
report_type	VARCHAR	50	NOT NULL	Types of report
content	TEXT	–	NOT NULL	Report content (PDF/TEXT)

Initial Screen Layouts

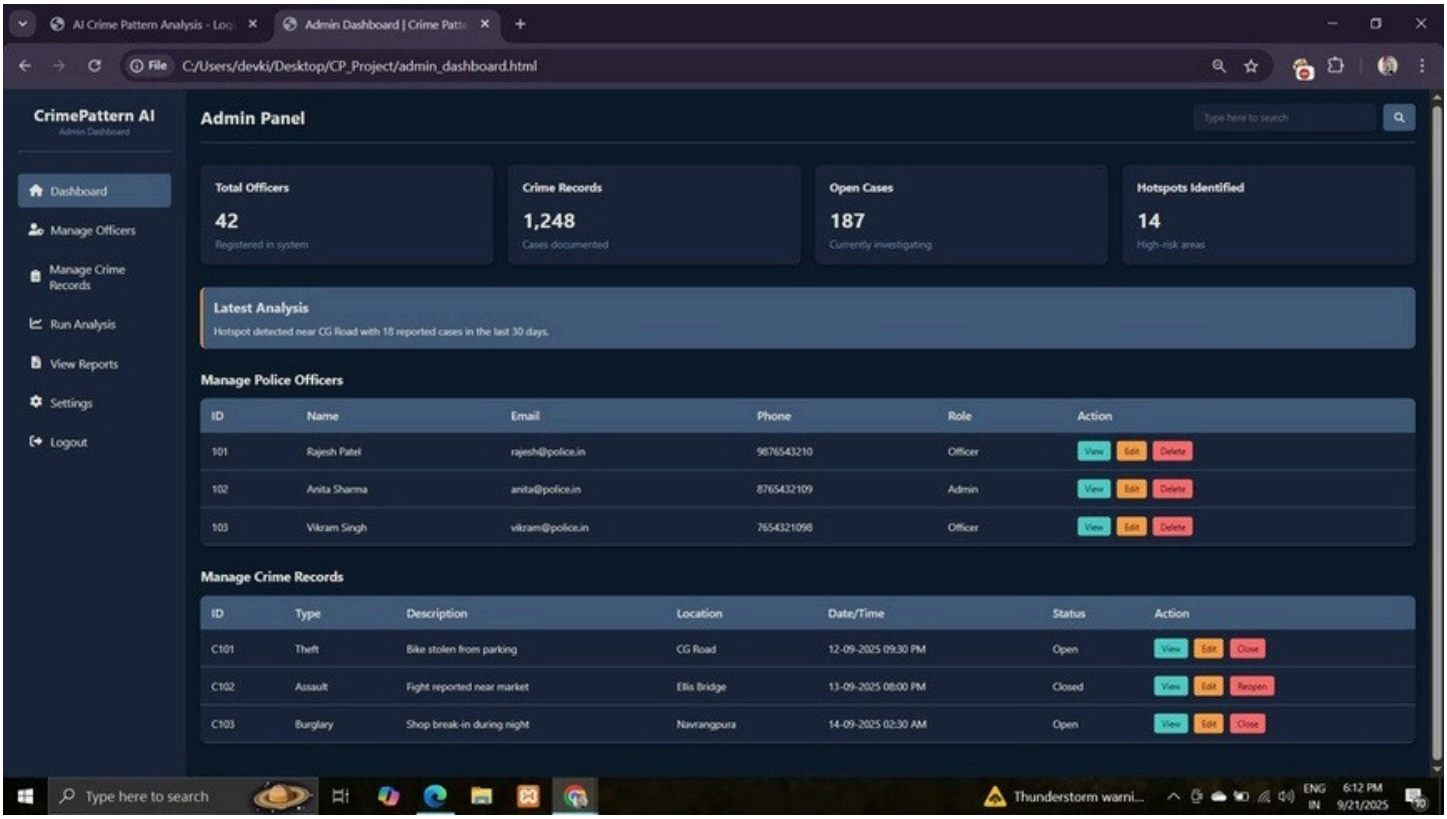
1. Login Page



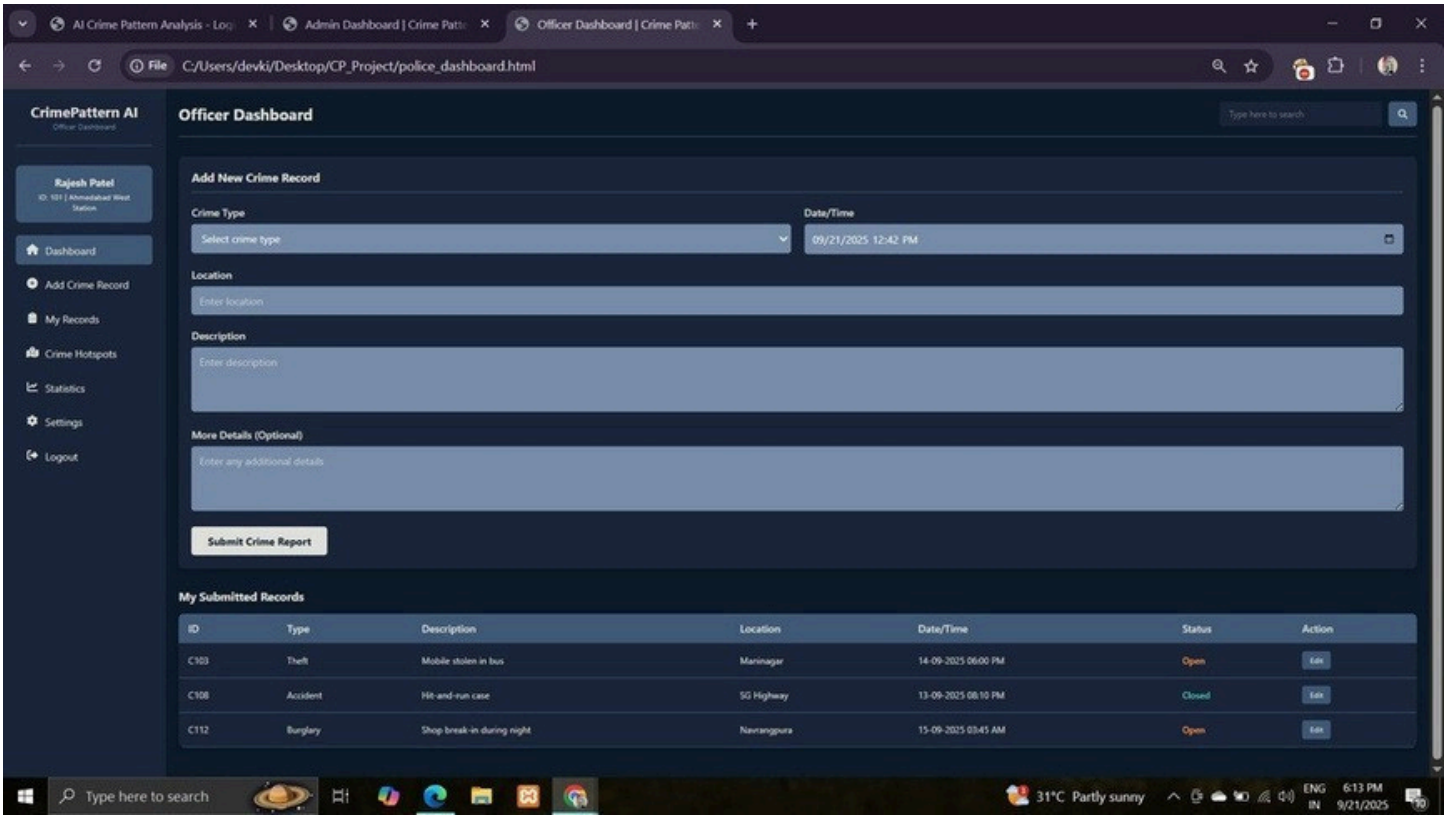
2. Register page



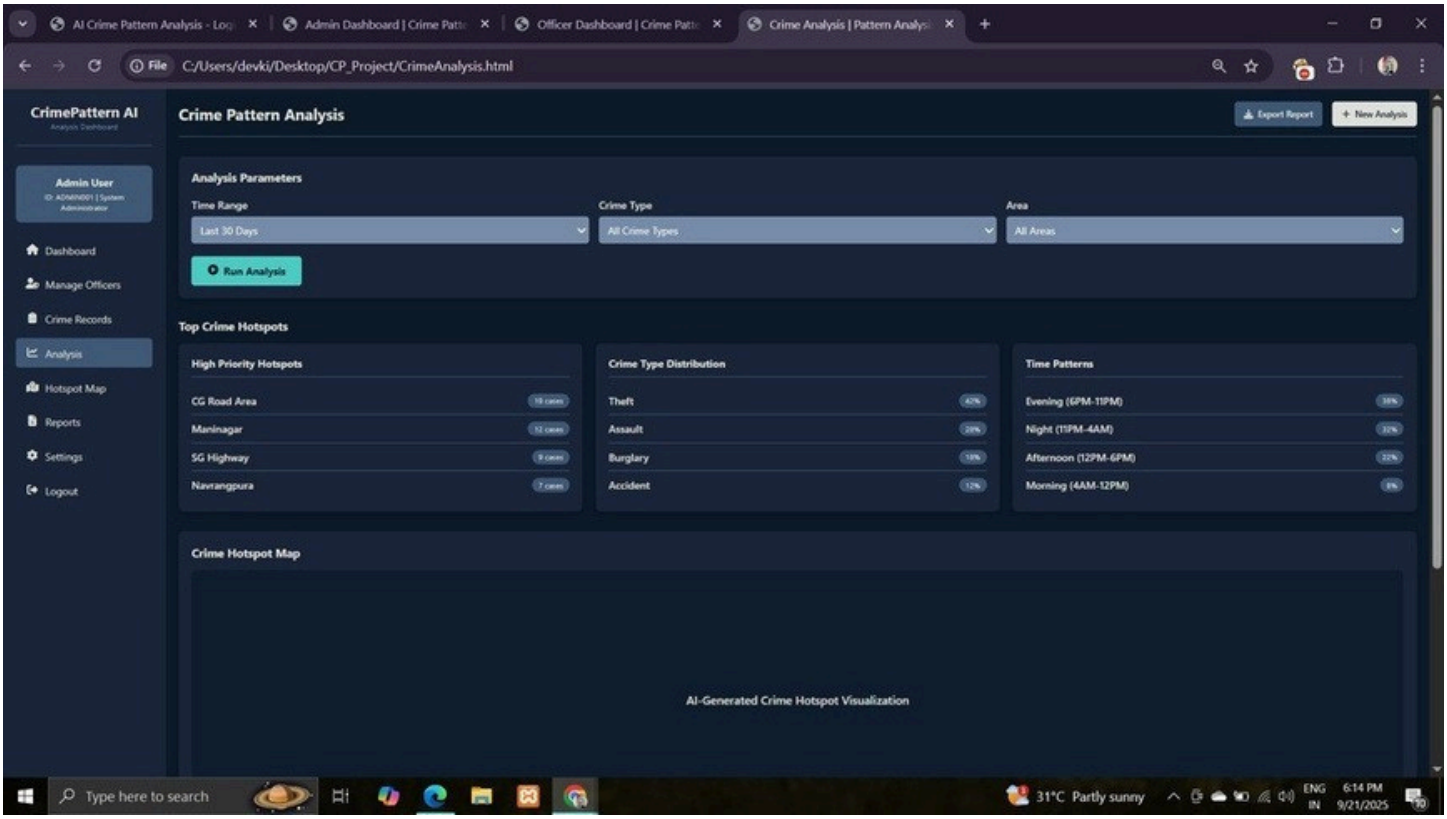
3. Admin Dashboard



4. Police Dashboard



5. Crime Analysis Page



Conclusion

The **AI-Powered Crime Pattern Analysis System** successfully provides a platform for storing, managing, and analyzing crime records. It combines web technologies (HTML, CSS, Java, MySQL) with Artificial Intelligence (Python KMeans clustering) to identify crime hotspots and present them visually.

This project helped us understand how real-world crime data can be organized and analyzed with the help of AI. By implementing modules for **users (data entry)** and **admins (management & analysis)**, we created a system that is both functional and practical.
Through this project, we learned teamwork, integration of multiple technologies, and applying machine learning in a real-life scenario. In the future, this system can be extended with features like predictive crime forecasting, GIS integration, and mobile application support, making it even more powerful for law enforcement use.

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