VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi - 590018, Karnataka State, India

PROJECT REPORT ON

"AI LEGAL ASSISTANT FOR LAW ENFORCEMENT"

Submitted in partial fulfillment of 8th Semester

Project of

BACHELOR OF ENGINEERING
IN
INFORMATION SCIENCE AND ENGINEERING

Submitted by:

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Carried out at:

SJC INSTITUTE OF TECHNOLOGY

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING
CHIKKABALLAPUR-562101 2024-2025

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Sri Adichunchanagiri Shikshana Trust®

S.J.C INSTITUTE OF TECHNOLOGY

Information Science & Engineering Department

Chikkaballapur-562101

CERTIFICATE

This is to certify that the project work entitled **"AI LEGAL ASSISTANT FOR LAW ENFORCEMENT"** is a bonafide work carried by **BABUREDDY B N (1SJ21IS009)** in partial fulfillment for the award of **Bachelor of Engineering in Information Science and Engineering in 8th semester of the Visvesvaraya Technological University, Belagavi** during the year **2024-2025.** It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the department library. The project report has been approved as it satisfies the academic requirements in respect to Eighth Semester Project work prescribed for the Bachelor of Engineering.

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DECLARATION

I, **BABUREDDY B N (1SJ21IS009)** students of **8th semester B.E, S.J.C Institute of Technology** , hereby declare that the project entitled “**AI LEGAL ASSISTANT FOR LAW ENFORCEMENT**” has been carried out by me under the supervision of internal guide **Mrs. Vindya L, Dept. of ISE,** submitted in partial fulfillment of the requirement of the award in the degree **of Bachelor of Engineering in Information Science and Engineering by the Visvesvaraya Technological University** during the academic year 2024-2025. This report has not been submitted to any other organization or University for any award of degree or certificate.

Place:

Date:

BABUREDDY B N
(1SJ21IS009)

ABSTRACT

The AI Legal Assistant for Law Enforcement is a conversational AI system designed to assist police and legal personnel with real-time access to Indian Penal Code (IPC) information. Built using Python, Rasa, MySQL, and FastAPI, it provides accurate legal references, crime classifications, and punishment details through a user-friendly chat interface. It features a structured database, real-time communication, and web scraping tools to ensure up-to-date legal content. The system enhances legal decision-making by automating access to relevant IPC sections and maintaining a comprehensive crime-information database, thereby supporting law enforcement in drafting FIRs and handling legal queries efficiently and accurately.

ACKNOWLEDGEMENT

With great pride, I express my sincere gratitude and salutations to the feet of his holiness **Paramapoojya Jagadguru Byravaikya Padmabhushana Sri Sri Sri Dr. Balagangadharanatha Maha Swamiji**, his holiness **Paramapoojya Jagadguru Sri Sri Sri Dr. Nirmalanandanatha Maha Swamiji** and **Pramapoojya Sri Sri Mangalnatha Swamiji**, Sri Adichunchanagiri Mutt for their unlimited blessings.

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BABUREDDY B N **1SJ21IS009**

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

CHAPTER-1

INTRODUCTION

1.1 Overview

Law enforcement agencies are entrusted with the responsibility of maintaining law and order, investigating crimes, and ensuring justice. However, navigating the complex legal landscape, particularly the Indian Penal Code (IPC), poses significant challenges for officers during investigations and case documentation. Manually referencing legal provisions, understanding applicable IPC sections, and applying appropriate punishments are time-consuming and prone to human error. This not only hampers operational efficiency but can also delay justice delivery, especially when timely legal clarity is crucial during fieldwork or FIR drafting. Furthermore, the growing volume of cases and the need for accurate legal classification have increased the burden on officers. Addressing these issues requires a solution that is fast, reliable, and easily accessible to frontline personnel.

With the rapid advancement of artificial intelligence (AI) and natural language processing (NLP) technologies, there is a growing opportunity to bridge the gap between legal knowledge and law enforcement practice. Traditional tools such as legal handbooks or static online databases are insufficient for quick, interactive, and accurate legal reference. Recognizing this challenge, this project introduces an AI-powered Legal Assistant designed specifically to support law enforcement officers. The system focuses on delivering comprehensive legal information through a conversational chatbot interface and an automated First Information Report (FIR) generation module. This intelligent solution not only simplifies the retrieval of legal information but also enhances productivity in day-to-day police operations. By leveraging AI, the project ensures that officers can make well-informed decisions within seconds.

The proposed system is built using Python, Rasa, MySQL, and FastAPI, integrating intelligent dialogue management, a structured legal database, and real-time communication tools. Users can query crime-related information, IPC sections, and punishments via the chatbot, while a structured FIR form allows easy entry of case details. Once the necessary information is filled, the system automatically generates a formatted FIR and provides it as a downloadable PDF. The FIR is neatly structured, legally compliant, and ready for official use, saving significant time for officers. The integration of web scraping tools also ensures the legal database remains updated with the latest statutes and amendments, enhancing the reliability of information.

Overall, by integrating artificial intelligence into the legal workflow of law enforcement, this project not only addresses current operational gaps but also aligns with the broader vision of digital governance and smart policing in India. The AI Legal Assistant can significantly reduce the cognitive load on officers, streamline routine tasks such as legal referencing and FIR drafting, and ensure that legal documentation is accurate and compliant with current laws. Beyond immediate benefits, the system also sets the foundation for future enhancements such as multilingual support, integration with other government databases, and analytics for crime pattern recognition. As technology continues to evolve, such intelligent legal tools can play a transformative role in strengthening the justice delivery system and enhancing transparency, accountability, and public trust in law enforcement agencies.

1.2 Problem Statement

Law enforcement officers in India frequently encounter difficulties in promptly accessing and correctly applying relevant legal provisions from the Indian Penal Code (IPC) during investigations and case handling. The reliance on printed manuals, outdated documents, or personal knowledge often results in delays, misclassification of crimes, and procedural errors. These challenges are more pronounced in rural or under-resourced areas, where access to legal experts and up-to-date legal materials is limited. Furthermore, most existing legal reference tools lack interactivity and real-time support, making it harder for officers to retrieve specific legal information when they need it most. This gap in accessibility and usability affects the accuracy and speed of legal decision-making on the ground.

In addition to legal referencing issues, the manual drafting of First Information Reports (FIRs) introduces the risk of inconsistencies, missing details, and legal non-compliance, which can hinder investigations and weaken cases in court. The time-consuming nature of this process adds to the workload of police officers, reducing overall operational efficiency. These challenges collectively impact the quality of law enforcement, delay justice delivery, and can erode public confidence in police agencies. To address these problems, there is a clear need for an AI-powered legal assistant that can provide instant, reliable legal information and automate FIR generation. Such a system would not only reduce errors and save time but also ensure legal accuracy, support better case outcomes, and strengthen the effectiveness of policing in both urban and rural contexts.

1.3 Significance and Relevance

The AI Legal Assistant holds significant potential in modernizing law enforcement by providing instant access to accurate legal information from the Indian Penal Code (IPC) and automating the FIR generation process. It addresses critical challenges such as delays, misclassification of crimes, and procedural errors caused by reliance on manual legal references and outdated resources. By offering a user-friendly chatbot interface and structured legal database, the system empowers officers to make informed decisions quickly and confidently. The automation of FIR drafting enhances efficiency, consistency, and legal compliance, while reducing paperwork and clerical workload. Overall, this project aligns with the vision of digital governance and smart policing, contributing to a more transparent, accountable, and efficient law enforcement system in India. The system also ensures that legal updates and amendments are reflected in real time, keeping officers informed with the latest provisions. A key strength of the project is the custom-built legal database, meticulously created and validated to ensure accuracy and relevance for law enforcement use. Its scalable design allows for future enhancements, including multilingual support and integration with national crime databases.

1.4 Work Objectives

- Develop an AI-powered legal assistant that provides instant and accurate information on IPC sections, crimes, and punishments to support law enforcement officers.
- Build a custom, validated legal database containing IPC sections, crime classifications, and punishments for efficient and reliable information retrieval.
- Design a user-friendly conversational chatbot interface using Rasa to enable officers to query legal information through natural language.
- Implement a structured FIR generation module that allows users to input complaint details and automatically generate legally compliant FIRs in PDF format.
- Integrate real-time web scraping tools to ensure the legal database remains updated with the latest statutes, amendments, and legal provisions.
- Develop a secure MySQL database to store complaint records, legal provisions, and other relevant legal data for efficient management and retrieval.
- Ensure data privacy, security, and integrity across all system components, including chatbot interactions, database management, and FIR generation.

- Reduce dependency on legal experts during case handling by providing real-time AI assistance for legal queries and document preparation.
- Build a scalable and extensible system architecture that can support future enhancements such as multilingual support and integration with national police databases.

1.5 Methodology

- **Requirement Analysis:** Identify the functional and non-functional requirements of the AI Legal Assistant, focusing on law enforcement workflows, legal information needs, and FIR generation processes.
- **Database Design and Development:** Create a custom MySQL database to store IPC sections, crime classifications, punishments, and complaint records. Structure the database to support efficient retrieval and secure data management.
- **Data Collection and Validation:** Manually compile, verify, and organize legal information (IPC sections and punishments) to ensure accuracy, completeness, and relevance for police use.
- **Chatbot Development:** Use Rasa (version 3.6.2) to design and train the conversational AI chatbot, defining intents, entities, and responses for handling legal queries in natural language.
- **FIR Generation Module:** Develop a structured web form for officers to enter complaint details and implement automatic FIR generation functionality, exporting the document in PDF format.
- **Web Application Development:** Build a user-friendly web interface using FastAPI and Jinja2, enabling seamless interaction with the chatbot, FIR form, and database.
- **Web Scraping Integration:** Use Selenium-based scraping tools to collect legal updates from authoritative sources and update the legal database as needed.
- **Real-time Communication Setup:** Implement WebSockets and Socket.IO to facilitate real-time communication between the chatbot, web interface, and database backend.
- **Security Implementation:** Apply authentication, data encryption, and validation mechanisms to ensure privacy, security, and integrity of legal data and complaint records.

- **Testing and Validation**: Conduct rigorous testing of all system components, including chatbot accuracy, FIR generation reliability, and database performance, to ensure functionality and robustness.
- **Deployment and Maintenance:** Deploy the system within the police department infrastructure and prepare user manuals and documentation for ongoing support and updates.

1.6 Organization of the Report

The project report is organized as follows:

1.6.1 **Chapter 1-Introduction** - This chapter tells about the problem statement, overview of the project, purpose, its objectives and its applicability with its theoretical outline.

1.6.2 **Chapter 2-Literature Survey** - Gives brief overview of the paper and the research sources that have been studied to establish through an understanding of the under consideration.

1.6.3 **Chapter 3-System Requirement Specification** - Discuss in detail about the different kind of requirement needed to successfully complete the project.

1.6.4 **Chapter 4-System Analysis** - It will provide a detailed analysis of the performance of the system.

1.6.5 **Chapter 5-System Design** - It gives a detailed description of the methodology used in the study.

1.6.6 **Chapter 6-Implementation** - It will provide a detailed description of the software and hardware components used in the study.

1.6.7 **Chapter 7-Testing** - It will provide a detailed description of the testing and validation process used to evaluate the performance of the system.

1.6.8 **Chapter 8-Conclusion and Future Enhancement** - It will provide a summary of the key findings of the study and recommendations for future enhancements to the system.

1.6.9 **Bibliography** - contains the references to the referred paper that is mentioned in the literature survey.

1.6.10 **Appendix** contains screenshots of our model and supplementary information.

CHAPTER 2

LITERATURE SURVEY

CHAPTER 2

LITERATURE SURVEY

Title: AI Legal Assistant for Law Enforcement

[1] **Title:** *COLLEGEBOT: Virtual Assistant System for Enquiry Using Natural Language Processing*
Authors: A. Selvi, V. Mounika, V. Rubika, B. Uvadharanee (2024)
Outcome: Developed a virtual assistant using NLP to handle college-related enquiries. It supports both voice and text input, automates responses to FAQs, and reduces administrative workload by enhancing information retrieval efficiency.

[2] **Title:** *Artificial Intelligence in Legal Decision-Making: Opportunities and Challenges*
Authors: A. Suresh, R. Kumar (2023)
Outcome: Explored how AI can support legal decision-making through case law analysis, document review, and legal prediction, while addressing challenges like ethical concerns and algorithmic bias.

[3] **Title:** *An AI-Based Framework for Crime Classification and Legal Advice Generation*
Authors: P. Kumar, M. Raj (2022)
Outcome: Proposed an AI framework integrating natural language understanding and classification models to assist law enforcement in crime categorization and generating relevant legal advice.

[4] **Title:** *Legal Document Analysis using NLP Techniques*
Authors: N. Patel, M. Sharma (2021)
Outcome: Implemented NLP methods such as named entity recognition and semantic matching to analyze legal documents, improving retrieval efficiency and legal information extraction.

[5] **Title:** *LAPIS (Language Model-Augmented Police Investigation System)*
Authors: H. Kim et al. (2024)
Outcome: Presented an AI system using large language models to support police investigations by analyzing documents, suggesting legal provisions, and enhancing investigative workflows..

[6] **Title:** *LegalPro-BERT: Fine-Tuned Transformer for Legal Provision Classification*
Author: A. Tewari (2024)
Outcome: Introduced LegalPro-BERT, a BERT-based model fine-tuned for classifying legal provisions. Demonstrated how transformer models can accurately understand and categorize legal text, aiding in legal document analysis and FIR drafting for law enforcement.

[7] **Title:** *A Survey of NLP Techniques for the Legal Domain*
Authors: F. Ariai, G. Demartini (2024)
Outcome: Presented a comprehensive survey of NLP applications in law, reviewing models, datasets, and key challenges. Provides guidance on selecting suitable techniques for developing AI-driven legal assistants tailored to law enforcement needs.

CHAPTER 3

SYSTEM REQUIREMENTS AND SPECIFICATION

CHAPTER-3

SYSTEM REQUIREMENT AND SPECIFICATION

3.1 System Requirements

The system requirements and specifications define the essential components needed for the efficient functioning of the AI-powered legal assistant system for law enforcement. The system requires a high-performance server or workstation with at least 8GB RAM, 100GB SSD storage, and a multi-core processor (Intel i5 8th Gen or equivalent) to manage large legal datasets, real-time communication, and rapid text processing. It utilizes a custom-built MySQL database for managing IPC sections, crime classifications, punishments, and complaint records. The frontend interface is developed using HTML, CSS, and Javascript templating to ensure a responsive and interactive user experience. The backend is developed using Python with FastAPI for building RESTful APIs, while the conversational chatbot is powered by Rasa NLU and Rasa Core for intelligent dialogue management.

Functionally, the system performs legal query processing and FIR generation using natural language processing (NLP) techniques, including Rasa NLU for intent classification and entity extraction, combined with custom string matching and validation algorithms. It enforces legal guidelines to recommend appropriate IPC sections, securely stores verified complaints, and generates structured FIRs in PDF format. The system integrates Selenium-based web scraping tools to update legal data periodically and ensures real-time communication through WebSockets and Socket.IO. It is designed to be scalable, handling multiple user queries simultaneously with a response time under three seconds. The system guarantees security, reliability, and usability by implementing encrypted data storage, secure database access, user authentication, and clear user feedback mechanisms. Additionally, it offers an intuitive interface for efficient legal assistance, accurate complaint registration, and seamless FIR resubmission.

3.2 Functional Requirements

- **User Authentication and Access Control :** The system must provide secure login and authentication mechanisms to ensure that only authorized law enforcement personnel can access complaint records and legal information.
- **Legal Query Processing :**The chatbot must allow users to enter queries related to crimes, IPC sections, and punishments in natural language, and provide accurate, relevant legal information in response**.**

- **Complaint Registration Form :** The system must provide a structured form for users to input complaint details such as complainant name, incident description, location, date, and crime type.
- **FIR Generation and Download :** The system must automatically generate a formatted and legally compliant FIR based on the input complaint details and allow users to download the FIR as a PDF document.
- **Database Management :** The system must securely store complaint records, IPC sections, and legal data in a MySQL database, supporting efficient retrieval, update, and deletion operations.
- **Real-time Interaction :** The system must support real-time communication between the user interface, chatbot, and backend server using WebSockets and Socket.IO.
- **Web Scraping for Legal Updates :** The system should collect and update legal data from trusted websites when needed.
- **Data Validation and Integrity :** All user inputs and system outputs must be validated to ensure data accuracy, prevent inconsistencies, and maintain the integrity of stored information.
- **System Performance :** The system must handle multiple simultaneous user requests with a response time under three seconds to ensure efficient and smooth operation.

3.3 Non-Functional Requirements

- **Performance** : The system should respond to user queries and actions within 2–3 seconds to ensure smooth usage.
- **Usability :** The system should have a simple and easy-to-use interface for all users, even those with basic technical knowledge.
- **Reliability :** The system should work consistently without crashes or failures, and save data safely at all times.
- **Scalability:** The system should be able to handle multiple users and increasing data without slowing down.
- **Security :** The system should protect user data with secure login, encrypted storage, and safe data transfer.

3.4 Hardware Requirements

- **Processor**: Intel Core i5 or AMD Ryzen 5 (or higher)
- **RAM**: Minimum 8GB (16GB recommended)
- **Storage**: Minimum 500 GB HDD / 256 GB SSD
- **Network**: Stable internet connection
- **Display**: Minimum 13-inch monitor with 1366x768 resolution

3.5 Software Requirements

- **Operating System:** Windows 10/11 or Ubuntu 20.04 LTS or higher
- **Programming Language:** Python 3.8.10
- **Chatbot Framework:** Rasa Open Source 3.6.2
- **Database**: MySQL Server 8.0.33
- **Frontend Technologies :** HTML, CSS, js
- **Web Framework:** FastAPI 0.104.1
- **Template Engine :** Jinja2 3.1.2
- **ASGI Server :** Uvicorn 0.24.0
- **Web Scraping Tools :** Selenium 4.18.1 and WebDriver Manager 4.0.1
- **Real-Time Communication :** websockets 12.0 and python-socketio 5.10.0
- **Web Browser** : Latest Chrome or Firefox for Selenium-based scraping and user testing
- **IDE/Tools:** VS Code / PyCharm

3.6 Performance Requirements

- **Response Time :** The system should respond to user queries and actions (chatbot replies, form submissions, FIR generation) within 2–3 seconds.
- **Concurrent Users :** The system should support at least 10–15 users accessing the application simultaneously without performance issues.
- **Database Retrieval Speed :** The system should fetch and display legal information from the database within 1–2 seconds**.**
- **FIR Generation Time :** The FIR document should be generated and made available for download within 5 seconds after form submission.
- **System Uptime :** The system should be available and functional at least 99% of the time during working hours to ensure reliability.

CHAPTER 4

SYSTEM ANALYSIS

CHAPTER-4

SYSTEM ANALYSIS

4.1 Existing System

The current system for registering complaints and providing legal references in police stations is primarily manual. Police officers collect complaint details either verbally or in written form and draft First Information Reports (FIRs) based on their understanding of applicable legal provisions. To identify relevant IPC sections and legal references, officers rely on printed law books, their personal knowledge, or consultation with senior colleagues. There is no integrated digital tool to instantly provide legal information, guide FIR drafting, or standardize the process across different police stations. This results in a time-consuming and sometimes inconsistent workflow, especially when handling complex or sensitive cases.

One major challenge is the variation in legal interpretation due to differing levels of experience and knowledge among officers. Similar complaints may be treated differently across stations, leading to discrepancies and confusion. Officers also have to manually search for applicable legal sections and past cases, which increases their workload and can slow down FIR registration. As the number of cases rises, the manual system struggles to process complaints efficiently, creating bottlenecks that hinder timely investigation and justice delivery.

Despite these limitations, the manual approach offers certain benefits. Human officers can apply contextual judgment, cultural sensitivity, and discretion in exceptional or complicated situations that automated systems may not fully grasp. Additionally, manual processing allows for administrative oversight, as FIRs undergo careful review before final approval. Introducing an AI-powered legal assistant will complement human expertise by improving speed, accuracy, and consistency, while reducing repetitive workload and administrative burden on police officers.

4.2 Limitations

- **Time-Consuming Process**– Manual drafting and legal referencing require significant time and effort, leading to delays in FIR registration.
- **Inconsistent Application of Laws -** Variations in officers’ legal knowledge cause inconsistency in how legal provisions are applied across cases and stations.

- **High Workload on Officers -** Officers must manually search for relevant sections, past cases, and legal references, increasing their workload and stress.
- **Prone to Human Error**– Oversights and mistakes may occur in identifying relevant legal sections, risking inaccurate or incomplete FIRs.
- **Limited Scalability** –The manual system struggles to handle large volumes of complaints and complex cases efficiently.
- **Lack of Instant Feedback** – Complainants experience delays, as officers cannot provide immediate confirmation on the validity or completeness of FIRs.
- **Difficult Knowledge Retention -** Officers must rely on memory or physical documents, which can make it harder to recall legal provisions quickly.

4.3 Advantages

- **Faster Complaint Processing :** Automates FIR drafting, drastically reducing time compared to manual procedures.
- **Improved Accuracy and Consistency :** Ensures uniform application of legal information, minimizing human errors and inconsistencies.
- **Instant Legal Reference and Section Mapping :** Quickly provides relevant IPC sections and legal information through chatbot interaction.
- **Scalability :** Can efficiently manage multiple complaints simultaneously without fatigue, ensuring smooth functioning even under heavy workloads.
- **24/7 Availability :** Always accessible to assist in drafting and verifying legal documents anytime, improving operational efficiency.
- **Data Storage and Retrieval :** Maintains organized records of cases, enabling easy search, tracking, and analysis of past complaints and actions.
- **Reduction in Workload :** Frees officers from repetitive tasks, allowing them to focus on critical decision-making and field investigations.
- **Enhanced Transparency and Accountability :** Provides a standardized approach that reduces discretionary errors and increases trust in legal processes.
- **User-Friendly Interface :** Provides clear feedback and guidance, helping both officers and complainants navigate the legal process smoothly.
- **Supports Decision Making :** Offers suggestions and probability scores that help officers make informed decisions faster and with greater confidence.

CHAPTER 5

SYSTEM DESIGN

CHAPTER-5

SYSTEM DESIGN

5.1 Project Modules

- **User Interface Module** : This module is responsible for user interaction through a web-based frontend developed using HTML, CSS, JavaScript, and Jinja2. It includes the chatbot interface for legal queries and a complaint registration form for FIR generation.
- **Chatbot Module (Rasa)** : The chatbot module uses Rasa for natural language processing. It handles user queries related to crimes, IPC sections, and punishments by identifying intents and extracting entities. It also communicates with the backend and database to provide relevant legal responses.
- **NLP Backend Module** : This module processes the data received from the frontend, uses trained Rasa models to interpret it, and fetches appropriate legal content. It formats responses and handles interactions with the MySQL database.
- **Complaint Registration and FIR Generation Module** : This module provides a form for police officers to register complaints. Once the data is submitted, the system generates a legally formatted FIR and allows it to be downloaded as a PDF document.
- **Database Module (MySQL)** : The MySQL database stores structured legal information, including IPC sections, crime mappings, user complaint records, and logs. It ensures secure and efficient data storage and retrieval.
- **Web Scraping Module (Selenium)** : This module uses Selenium to collect updated IPC sections and other legal information from government or authoritative sources. The extracted data is used to keep the database current.
- **Real-Time Communication Module (WebSockets/Socket.IO)** : Enables fast and real-time communication between the chatbot, backend, and frontend, ensuring that user queries are answered instantly without page reloads.
- **Security and Authentication Module** : Ensures that only authorized users (e.g., police personnel or admin) can access the system. It handles login, session management, and data protection.

5.2 Activity Diagram

The activity diagram illustrates the step-by-step flow of how the AI Legal Assistant system processes a user's legal query. The process begins when a user opens the webpage and initializes the chatbot interface. A WebSocket connection is established to enable real-time communication. When the user types and sends a query, it is displayed and forwarded to the NLP backend. The backend parses the intent and entities from the message to determine the type of request. If the query requires legal data, the system queries the MySQL database and formats the legal information. Otherwise, it generates a general reply. The final response is then sent back to the user and displayed on the screen. This flow ensures that legal queries are handled efficiently with accurate, real-time feedback through a structured and interactive process.

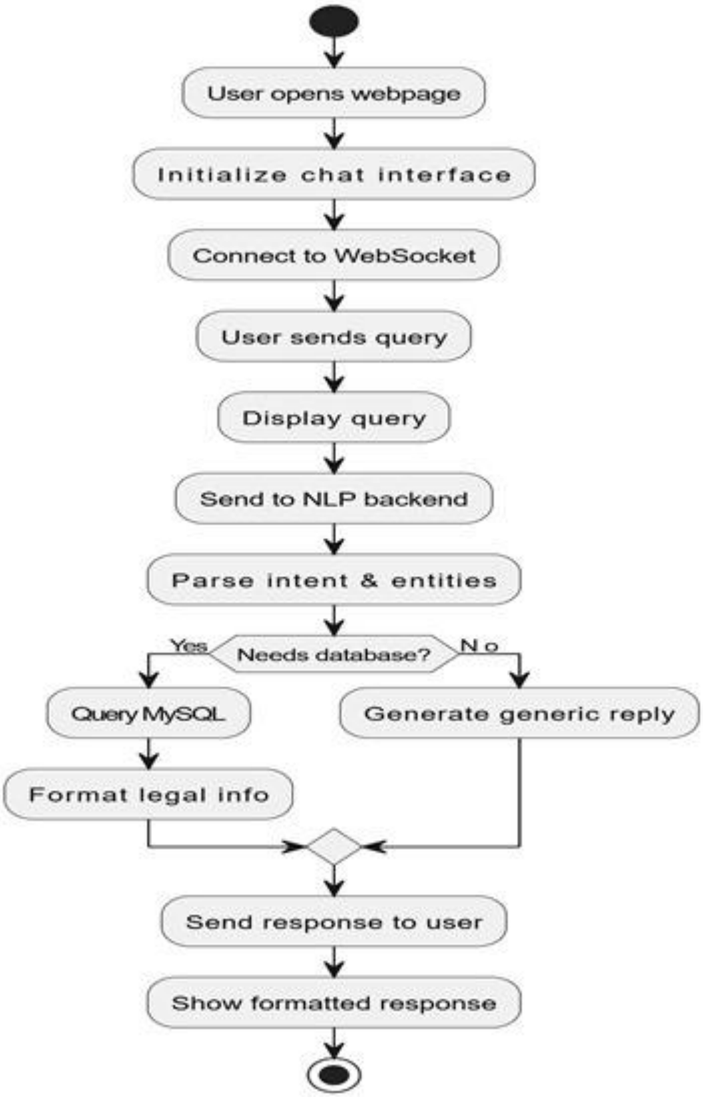

Figure 5.2 Activity Diagram

5.3 Use Case Diagram

The use case diagram represents the different actions that an admin can perform within the AI Legal Assistant system. The admin is the main actor and is responsible for managing and maintaining the system. Key use cases include authenticating access, managing the legal database, monitoring system logs, training and deploying NLP models, and configuring the WebSocket server for real-time communication. The admin can also update IPC sections and crime data, as well as perform regular system backups. This diagram shows the administrative control over the system to ensure smooth operation, data accuracy, and security. It helps maintain the reliability of chatbot responses and ensures that the legal information is always up to date. The diagram also highlights the technical responsibilities required to keep the AI assistant functional and efficient.

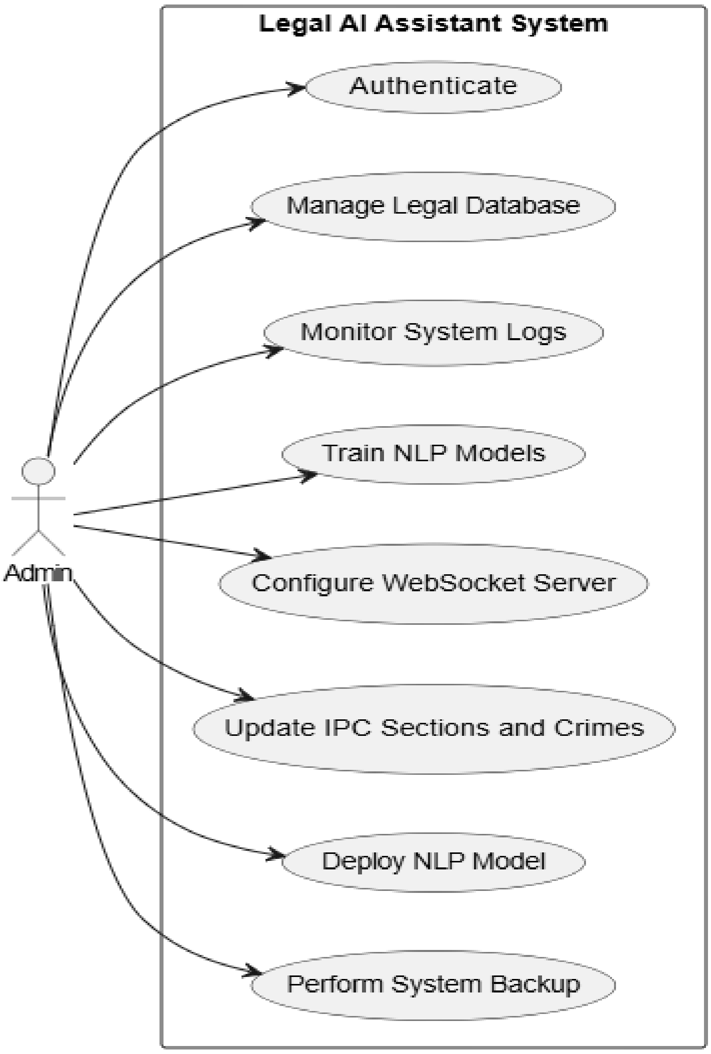

Figure 5.3 Use Case Diagram

5.4 Data Flow Diagram

The data flow diagram (DFD) shows how data moves through the AI Legal Assistant system during a legal query. The process starts when the user enters a crime-related question into the chat interface on the frontend. This message is then passed to the NLP backend (built using Rasa or Python), which processes the query by identifying key entities and intent. The backend then queries the legal database (MySQL) to retrieve the appropriate IPC sections and related information. Once the relevant data is found, it is returned to the NLP engine, which sends the formatted legal response back to the chat interface. Finally, the legal information is displayed to the user, completing the interaction. This DFD clearly outlines the path of data through the system, ensuring transparency, accuracy, and efficiency in handling legal queries.

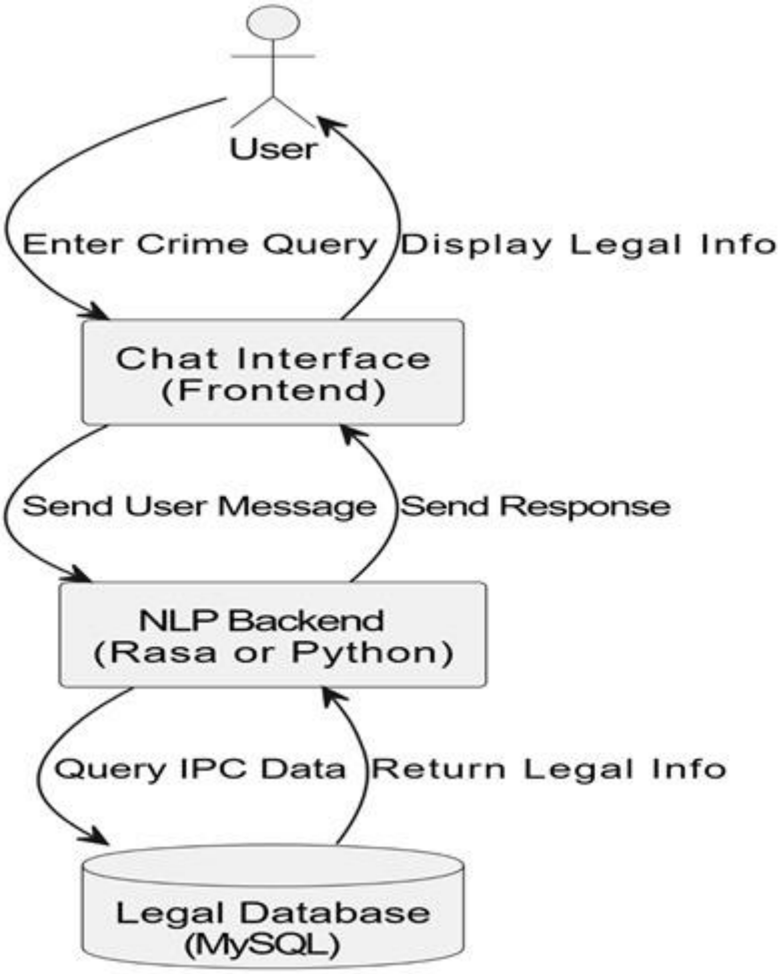

Figure 5.4 Data Flow Diagram

5.5 Sequence Diagram

The sequence diagram illustrates how the AI Legal Assistant system responds to a user's legal query, such as asking about a specific IPC section. The user types a message in the web interface, which is sent in real-time to the backend through a WebSocket server. The NLP backend (Rasa) processes the message, identifies the user's intent and relevant legal terms, and queries the MySQL database to fetch the correct IPC section and related information. This legal data is then formatted into a proper response and sent back to the user interface, where it is displayed clearly. This process ensures fast and accurate legal assistance through smooth communication between system components.

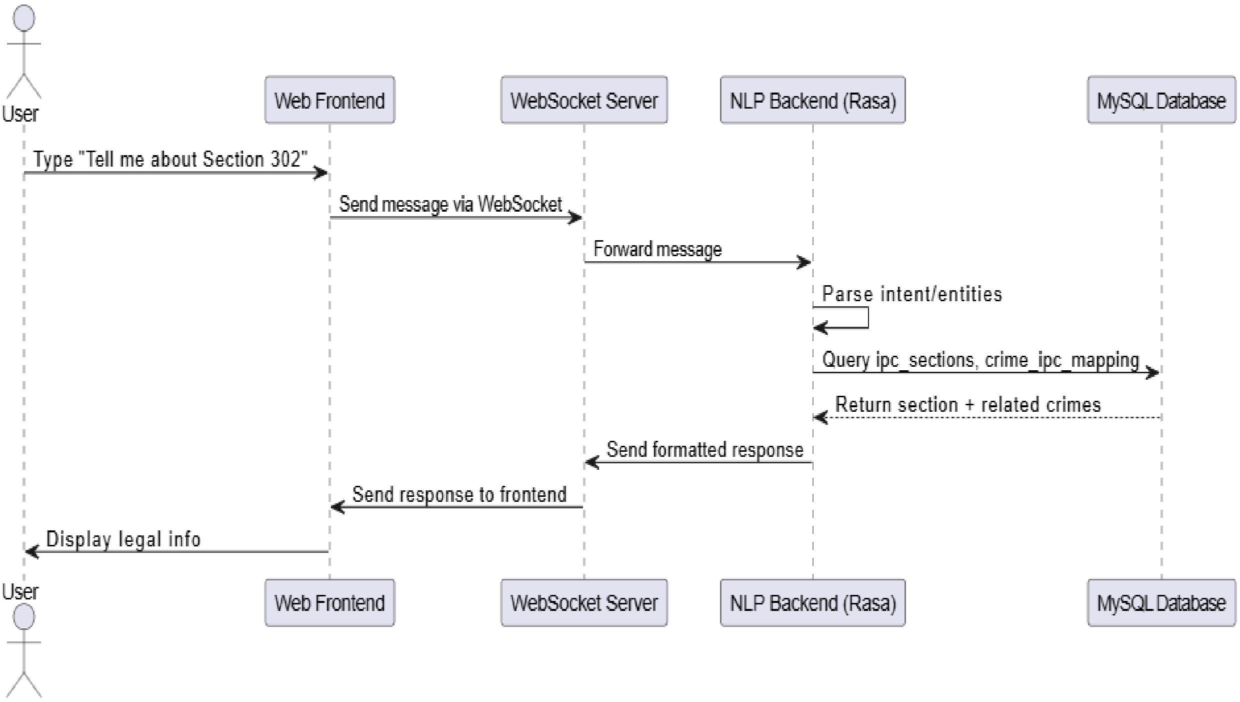

Figure 5.5 Sequence Diagram

CHAPTER 6

IMPLEMENTATION

CHAPTER-6

IMPLEMENTATION

6.1 Pseudo-code

Webpage Frontend (HTML + JavaScript)

```
• ON PAGE LOAD:
      - Render chat interface (sidebar, chat area, input box).
      - Connect to WebSocket server at ws://localhost:8080/ws.

• USER INTERACTION LOOP:
      - Wait for user to type a message.
      - Enable "Send" button when input is not empty.
      - On "Send" button click or Enter key:
      - Display user's message in chat window.
      - Send message to WebSocket server.
      - Show "Legal AI Assistant is typing..." indicator.

• WEBSOCKET EVENT HANDLERS:
      - On connection open:
      - Display "Connected to chat server" system message.
      - On message received:
      - Hide typing indicator.
      - Parse message type:
      - If 'bot_message': Display bot's response(s) in chat window, with formatting for
        legal info.
      - If 'user_message': Display user message (echo).
      - If 'error': Display error message.
      - Otherwise: Display raw message.
      - On error:
      - Display "Connection error occurred" system message.
      - On close:
      - Display "Connection closed" system message.
```

- MESSAGE FORMATTING:
  - For legal info responses, format sections (e.g., headings, descriptions, IPC sections) with HTML.
  - For other messages, escape HTML and apply basic formatting (bold, italics, lists).

WebSocket Server (Backend Bridge)

- ON CLIENT CONNECTION (ws://localhost:8080/ws):
  - Accept WebSocket connection from client.
- ON MESSAGE FROM CLIENT:
  - Receive user message.
  - (Optional) Log or echo user message back as 'user_message'.
  - Pass user message to NLP backend (Rasa or custom Python logic).
  - Wait for response(s) from backend:
  - If response is legal info, format as 'bot_message'.
  - If error, format as 'error'.
  - Send response(s) to client via WebSocket.
- ON CLIENT DISCONNECT:
  - Clean up any session or resources if needed.

NLP Backend (Rasa)

- ON RECEIVING MESSAGE FROM WEBSOCKET SERVER:
  - Parse user message using NLU (Natural Language Understanding).
  - Determine user intent (e.g., ask about crime, IPC section, punishment, etc.).
  - Extract entities (e.g., crime name, section number).
- IF intent requires database info:
  - Trigger appropriate custom action (see below).
- ON RESPONSE:
  - Format response as plain text or structured legal info.
  - Return response to WebSocket server for delivery to frontend.

Custom Actions (Database Query Logic)

a. Query Crime Information

- ON action_query_crime:
    - Extract crime name from user message/entities.
    - If not found, check for cyber crime keywords.
    - If still not found, prompt user for clarification.
    - Connect to MySQL database.
    - Query 'crimes' table for crime details.
    - If not found, inform user.
    - Query 'crime_ipc_mapping' for related IPC sections.
    - For each IPC section, get details from 'ipc_sections' table.
    - Format response:
    - Crime description, severity, category, bailable, cognizable, compoundable.
    - List of related IPC sections (number, title, description, punishment).
    - Return formatted response to NLP backend.

b. Query IPC Section Information

- ON action_query_ipc_section:
    - Extract IPC section number from user message/entities.
    - If not found, prompt user for clarification.
    - Connect to MySQL database.
    - Query 'ipc_sections' table for section details.
    - If not found, inform user.
    - Query 'crime_ipc_mapping' for related crimes.
    - Format response:
    - Section title, description, punishment.
    - List of related crimes (name, description, severity).
    - Return formatted response to NLP backend.

Database Layer

- DATABASE TABLES:
  - crimes: id, name, description, severity, category, bailable, cognizable, compoundable, etc.
  - ipc_sections: id, section_number, title, description, punishment, etc.
  - crime_ipc_mapping: crime_id, ipc_section_id
- DATABASE OPERATIONS:
  - SELECT, JOIN, and FILTER as needed for queries above.
  - Handle connection errors and close connections after use.

Data Flow Summary

User (Webpage)
⇅ (WebSocket)
WebSocket Server (ws://localhost:8080/ws)
⇅ (HTTP API or direct call)
NLP Backend (Rasa or custom Python)
⇅ (MySQL)
Database (crimes, ipc_sections, mapping)

Example End-to-End Flow

- User types: "Tell me about Section 302"
- Frontend sends: "Tell me about Section 302" via WebSocket
- WebSocket server receives, forwards to NLP backend
- NLP backend parses intent, triggers action_query_ipc_section
- Action queries MySQL for section 302, gets details and related crimes
- Action formats response, returns to NLP backend
- NLP backend sends response to WebSocket server
- WebSocket server sends response to frontend
- Frontend displays formatted legal info in chat window

CHAPTER 7

TESTING

CHAPTER-7

TESTING

7.1 Methods of Testing

The testing strategy for the system involved a combination of automated and manual testing methods, applied at different stages of development. Each method was carefully selected to ensure comprehensive coverage of the application’s behavior and performance. The key objective was to validate individual modules, verify correct integration, confirm functional correctness, and ultimately ensure the software met user expectations. Below are the key testing methods used:

7.1.1Unit Testing

Unit testing is the process of testing individual components or functions of the software in isolation. The purpose is to ensure that each unit performs as expected. This form of testing is typically done by developers using testing frameworks such as PyTest, JUnit, or unit test. In this project, unit testing was applied to critical backend logic such as user input processing, data validation, and database operations. By catching bugs early in development, unit testing reduces the complexity of later-stage testing and simplifies debugging. Automated unit tests were written for functions like login authentication, data parsing, and error handling to ensure consistent and repeatable results. This contributed significantly to the stability of the application. Regular execution of these tests ensured that updates or changes to the code did not break existing functionality. As a result, individual components were validated thoroughly before integration, leading to a smoother development process.

7.1.2 Validation Testing

Validation testing ensures that the software meets the user requirements and behaves as intended under real-world conditions. It answers the question: "Are we building the right product?" This is different from verification, which asks: "Are we building the product right?" In this project, validation testing was conducted by comparing the system’s outputs with expected results based on given inputs. For instance, legal sections suggested by the system were compared to official law documents for accuracy. Any deviation was carefully analyzed and fixed. Validation testing helped guarantee that the final product was not only technically correct but also usable and beneficial to its target audience. It played a crucial role in ensuring the final system delivered meaningful and trustworthy results. Feedback from potential end users was also considered to improve the overall experience and functionality of the application

7.1.3 Functional Testing

Functional testing evaluates whether the system's features perform according to specified requirements. It focuses on user interactions and the outcomes of different functions. Each feature—like login, language selection, crime input, and legal section suggestion—was tested with a variety of input combinations to ensure it behaved as expected. This testing was done using test cases that described the feature, expected results, actual results, and pass/fail status. Tools such as Selenium and Postman (for APIs) can be used for automated or manual functional testing. Ensuring that all functionalities work correctly helped increase the reliability and usability of the application. This also ensured that edge cases and boundary inputs were handled gracefully without system failures.

7.1.4 Integration Testing

Integration testing verifies that different modules or services of the application work together as intended. Even if individual components pass unit tests, they may fail to work properly when combined. In this project, integration testing focused on ensuring smooth communication between the front-end (HTML/CSS), back-end (Python), the Rasa NLP engine, and the MySQL database. Test cases simulated real user workflows—like entering a crime description, getting follow-up questions, and receiving legal outputs. Integration issues like data misinterpretation or delayed responses were identified and resolved. This phase was critical to achieving a seamless and consistent user experience across all layers of the system. Regular integration runs also helped verify that recent changes did not break dependent modules.

7.1.5 User Acceptance Testing

User Acceptance Testing (UAT) is the final phase of testing, performed by actual users to determine if the software is ready for deployment. It evaluates whether the system meets user needs in a real-world scenario. For this project, UAT involved law enforcement professionals and legal interns using the chatbot to input real or simulated crime cases. Feedback was collected on system accuracy, clarity of responses, and ease of use. Minor adjustments were made based on this feedback, such as improving the clarity of legal explanations or refining the follow-up questions. UAT confirmed that the solution was practical, efficient, and valuable for its intended users. The success of UAT provided the final approval to proceed with deployment and user onboarding.

7.2 Test Cases

7.2.1 Unit Testing

Test Cases:

Table 7.2.1: Unit Testing

Test Case ID	Module	Test Scenario	Expected Output	Status
UT01	Login Module	User enters correct admin credentials	Redirect to admin dashboard	Pass
UT02	Login Module	User enters incorrect credentials	Show "Invalid credentials" error message	Pass
UT03	Crime Input	User submits a well-formed crime description	System generates appropriate follow-up questions	Pass
UT04	Law Suggestion	NLP engine processes description and identifies legal section	Correct IPC section and crime category returned	Pass

7.2.2 Validation Testing

Test Cases:

Table 7.2.2: Validation Testing

Test Case ID	Module	Test Scenario	Expected Output	Status
VT01	Login Module	User enters a valid crime description	System accurately interprets the text and identifies intent	Pass
VT02	Login Module	System analyzes the entered crime details	Correctly extracts relevant entities (person, place, act)	Pass
VT03	Crime Input	Based on extracted data, suggest legal sections	Returns accurate IPC section and crime category	Pass
VT04	Law Suggestion	User enters crime in a supported second language (e.g., Hindi/Portuguese)	System detects language and responds accordingly	Pass

7.2.3 Functional Testing

Test Cases:

Table 7.2.3: Functional Testing

Test Case ID	Test Scenario	Feature	Expected Output	Status
FT01	User logs in with valid credentials	Login Functionality	Redirect to dashboard/home page	Pass
FT02	User selects a different language	Language Selection	Interface updates to the selected language	Pass
FT03	User submits crime description	Crime Description Handling	System generates follow-up questions	Pass
FT04	System processes follow-up answers and suggests IPC	Legal Section Assignment	Displays correct IPC section and crime category	Pass

7.2.4 Integration Testing

Test Cases:

Table 7.2.4: Integration Testing

Test Case ID	Modules Tested	Test Scenario	Expected Output	Status
IT01	Frontend & Backend	User logs in through the UI, data passed to backend	User successfully authenticated and redirected	Pass
IT02	Input Module & NLP Engine	User enters crime description, processed by Rasa NLP	Extracted entities and intent passed to next module	Pass
IT03	NLP Engine & Legal Section Mapper	NLP identifies crime details, system suggests legal sections	Correct IPC section based on extracted intent	Pass
IT04	Backend & MySQL Database	User information submitted and stored in database	Data successfully inserted into MySQL tables	Pass

7.2.5 User Acceptance Testing (UAT)

Test Cases:

Table 7.2.5: User Acceptance Testing (UAT)

Test Case ID	Test Scenario	Expected Output	Status
UAT01	Law enforcement user inputs a real-world crime case description	System asks relevant follow-up questions and suggests appropriate IPC sections	Pass
UAT02	Legal intern tests system with edge-case crime scenarios	System handles ambiguities gracefully and returns meaningful legal advice	Pass
UAT03	User tests the chatbot in a supported regional language (e.g., Hindi or Marathi)	Chatbot correctly interprets and responds in the selected language	Pass
UAT04	User provides feedback on clarity of legal explanations	System incorporates feedback; improved explanations deployed in next iteration	Pass

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENT

CHAPTER-8

CONCLUSION AND FUTURE ENHANCEMENT

8.1 Conclusion

The AI-powered Legal Assistant developed in this project addresses the critical need for faster, more accurate, and consistent legal support in law enforcement processes. Traditional systems for drafting First Information Reports (FIRs) and referencing IPC sections are time-consuming, prone to human error, and dependent on individual knowledge and experience. By automating complaint registration and legal referencing through a conversational chatbot and database-driven backend, the system improves the overall efficiency of FIR handling and ensures standardization in legal documentation. This shift from manual to semi-automated processes significantly reduces officer workload and enhances case-handling speed. The system is especially useful in high-volume environments where quick, legally accurate decisions are essential.

The use of technologies like Python, Rasa, FastAPI, and MySQL has enabled the development of a robust and user-friendly platform that can manage complaint data, provide instant legal responses, and generate downloadable FIRs in PDF format. Real-time interaction, web scraping capabilities for legal updates, and data validation features add significant value to the system. The assistant not only reduces the burden on officers but also minimizes delays in the complaint resolution process, helping to ensure justice is delivered more swiftly and fairly. The modular design of the system also makes it easier to maintain and extend in future versions. As such, the solution stands as a scalable foundation for future smart policing innovations.

Overall, the project proves that artificial intelligence can play a vital role in modernizing policing workflows. It empowers officers with a reliable digital tool that complements their expertise while enhancing transparency, accountability, and legal compliance. This Legal Assistant system serves as a foundation for future development and integration into broader criminal justice platforms, ultimately contributing to smarter, more efficient, and citizen-friendly law enforcement services. The positive impact of the system is not limited to internal efficiency, but also reflects in improved citizen satisfaction and trust. With continued improvements, this solution can serve as a key component in the nationwide push for digital law enforcement reform.

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8.2 Future Enhancement

The AI Legal Assistant for Law Enforcement has the potential for significant improvements and expansions to make it more robust, user-friendly, and widely applicable. The following enhancements can be implemented in future iterations to improve the system’s performance, accuracy, and adaptability:

- **Multilingual Support :** Integrating support for multiple regional languages using advanced speech-to-text and translation models to ensure accessibility for users across different linguistic backgrounds.
- **Advanced Legal Reasoning :** Implementing AI models capable of understanding complex legal arguments, case contexts, and suggesting legal provisions based on deeper semantic understanding rather than keyword matching.
- **Mobile Application Integration :** Developing a mobile-friendly version of the system to allow officers to draft and verify FIRs directly from the field, improving real-time data collection and documentation.
- **Integration with National Legal Databases :** Linking the assistant with national legal databases and case law repositories for real-time access to updated statutes, rules, and relevant precedents.
- **Automated Error Detection and Correction :** Enhancing the system to automatically detect inconsistencies or incomplete information in FIR drafts and suggest appropriate corrections or clarifications to the user.
- **Voice-Based Interaction :** Introducing voice-command capabilities to enable officers to interact with the system hands-free, facilitating faster information entry and retrieval, especially in field conditions.
- **Role-Based Access and Security Enhancements :** Strengthening system security with role-based access controls and encryption to ensure sensitive legal data is protected and accessible only to authorized personnel.
- **Analytics and Reporting :** Adding features to generate analytics reports on FIR trends, legal section usage, and complaint patterns, aiding administrative decision-making and resource planning..

BIBLIOGRAPHY

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[2] A. Suresh and R. Kumar, *"Artificial Intelligence in Legal Decision-Making: Opportunities and Challenges,"* in Proc. IEEE Int. Conf. Smart Technologies (ICST), 2023.

[3] P. Kumar and M. Raj, *"An AI-Based Framework for Crime Classification and Legal Advice Generation,"* in Proc. Int. Conf. Computational Intelligence and Knowledge Economy (ICCIKE), 2022.

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[6] A. Tewari, *"LegalPro-BERT: Classification of Legal Provisions by Fine-Tuning BERT Large Language Model," arXiv preprint arXiv:2404.10097*, 2024.

[7] F. Ariai and G. Demartini, *"Natural Language Processing for the Legal Domain: A Survey of Tasks, Datasets, Models, and Challenges," arXiv preprint arXiv:2410.21306*, 2024.

APPENDIX

APPENDIX

APPENDIX A: SNAPSHOTS

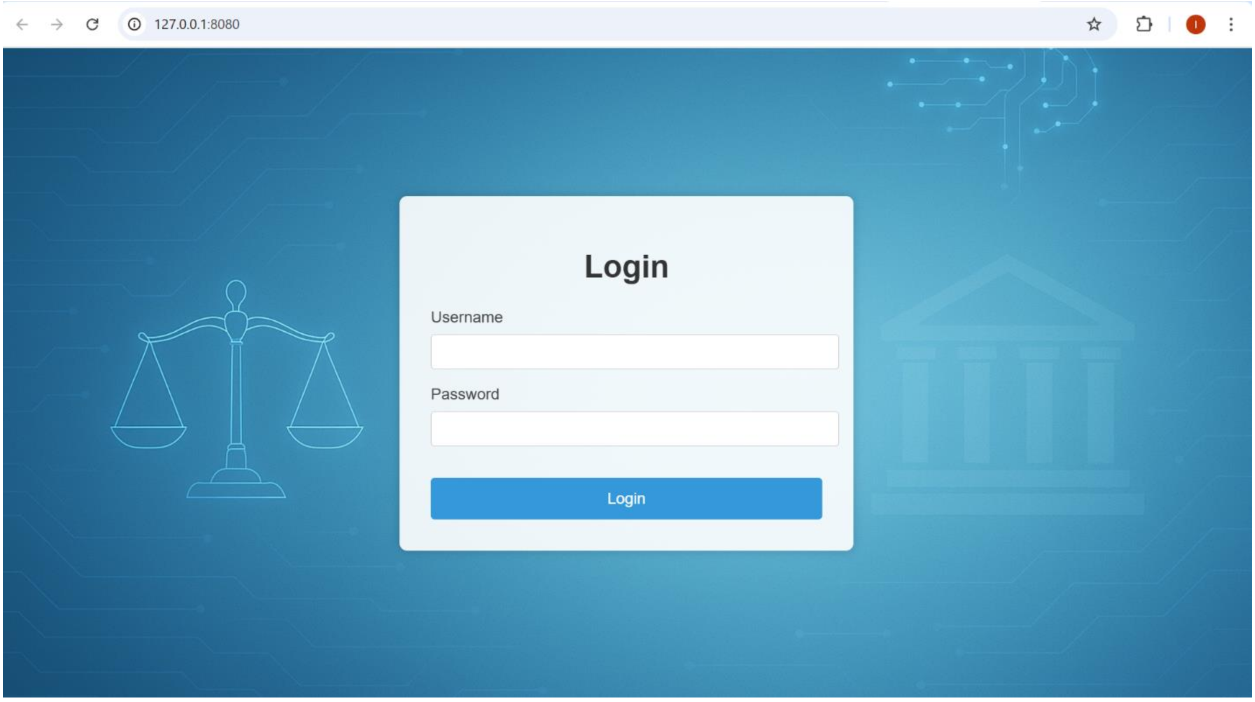
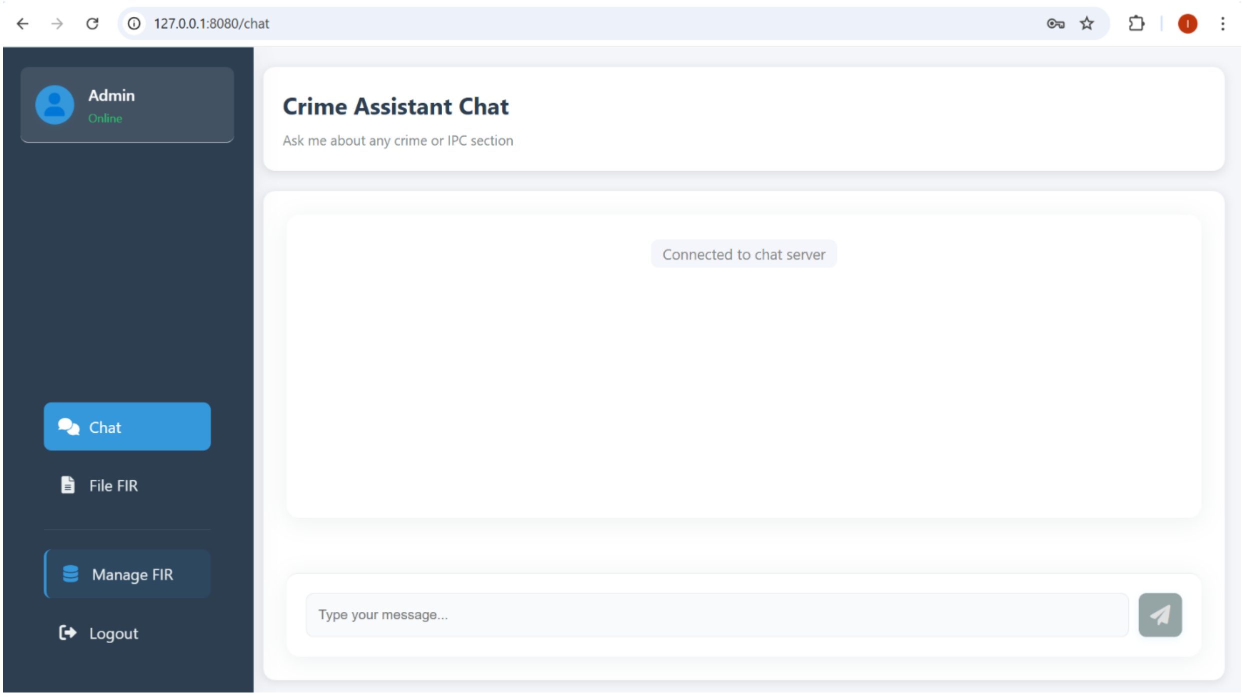


Figure A.1 Login Page



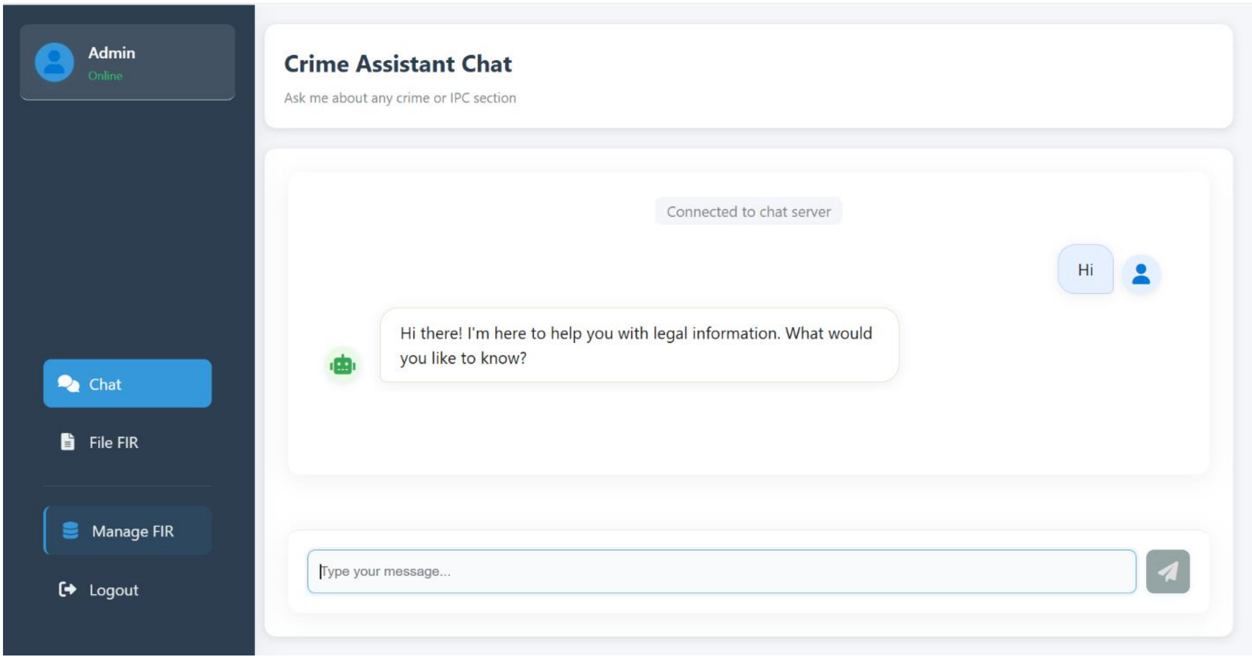
Crime Assistant Chat

Ask me about any crime or IPC section

Connected to chat server

Type your message...

Figure A.2 Chat Page



Crime Assistant Chat

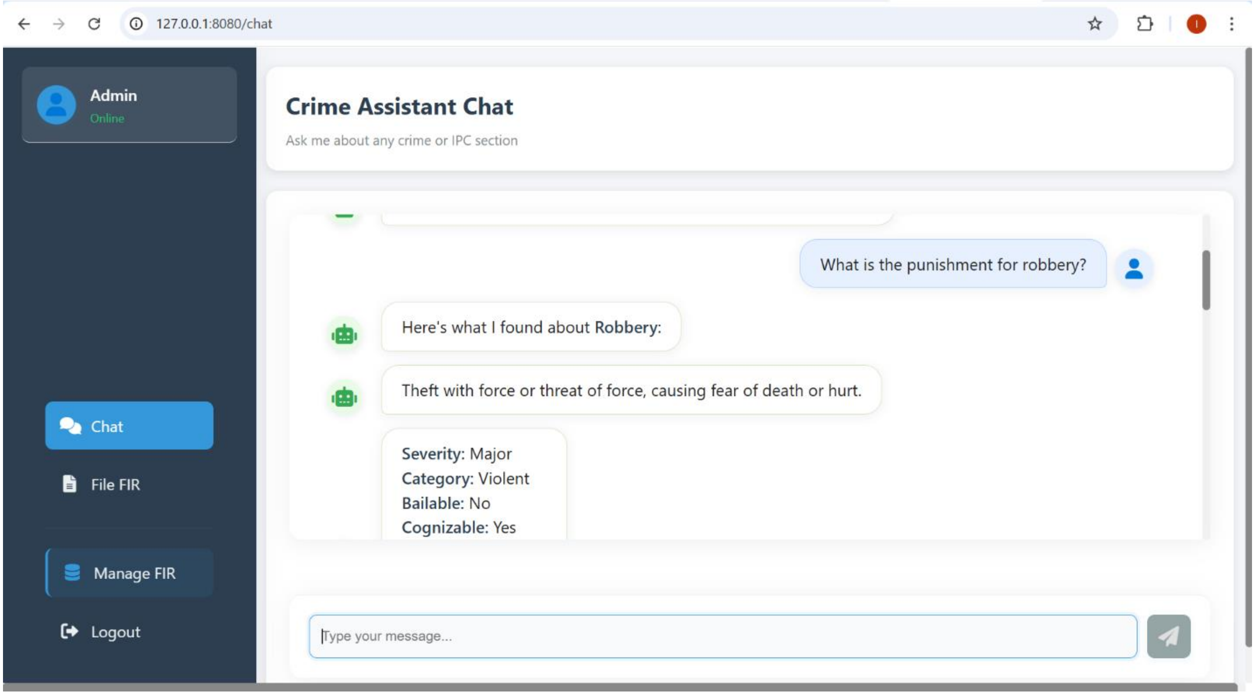
Ask me about any crime or IPC section

Connected to chat server

Hi

Hi there! I'm here to help you with legal information. What would you like to know?

Figure A.3 Greet Page



Crime Assistant Chat

Ask me about any crime or IPC section

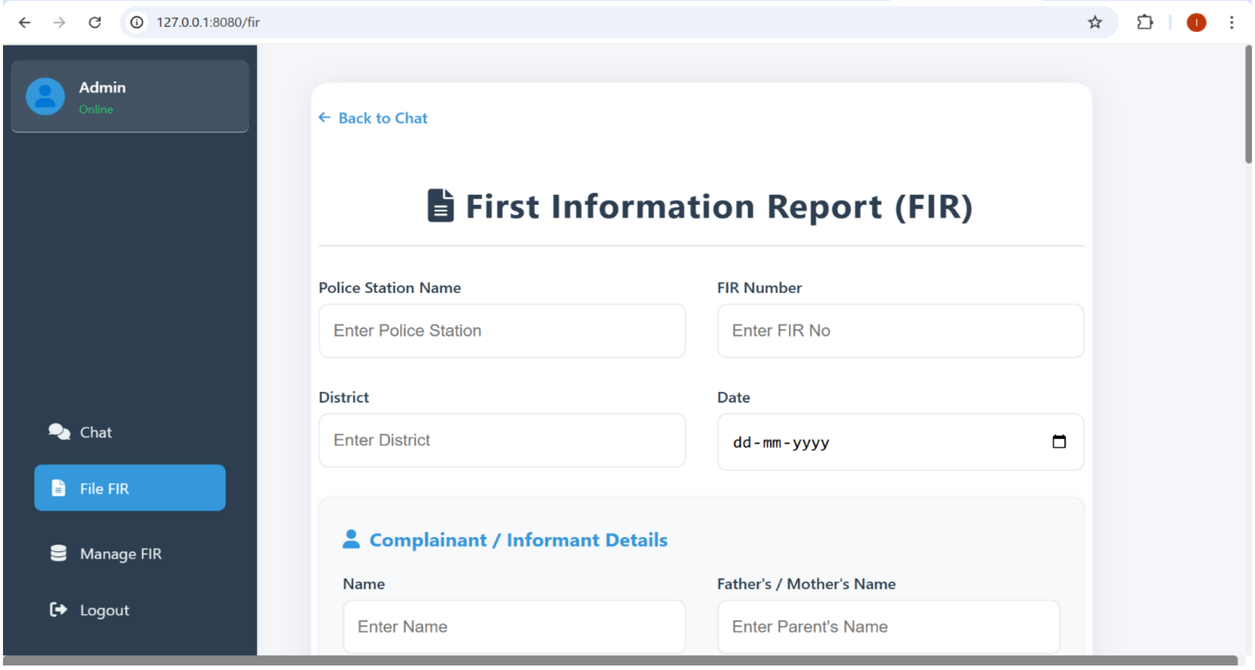
What is the punishment for robbery?

Here's what I found about Robbery:

Theft with force or threat of force, causing fear of death or hurt.

Severity: Major
Category: Violent
Bailable: No
Cognizable: Yes

Figure A.4 Crime Chat



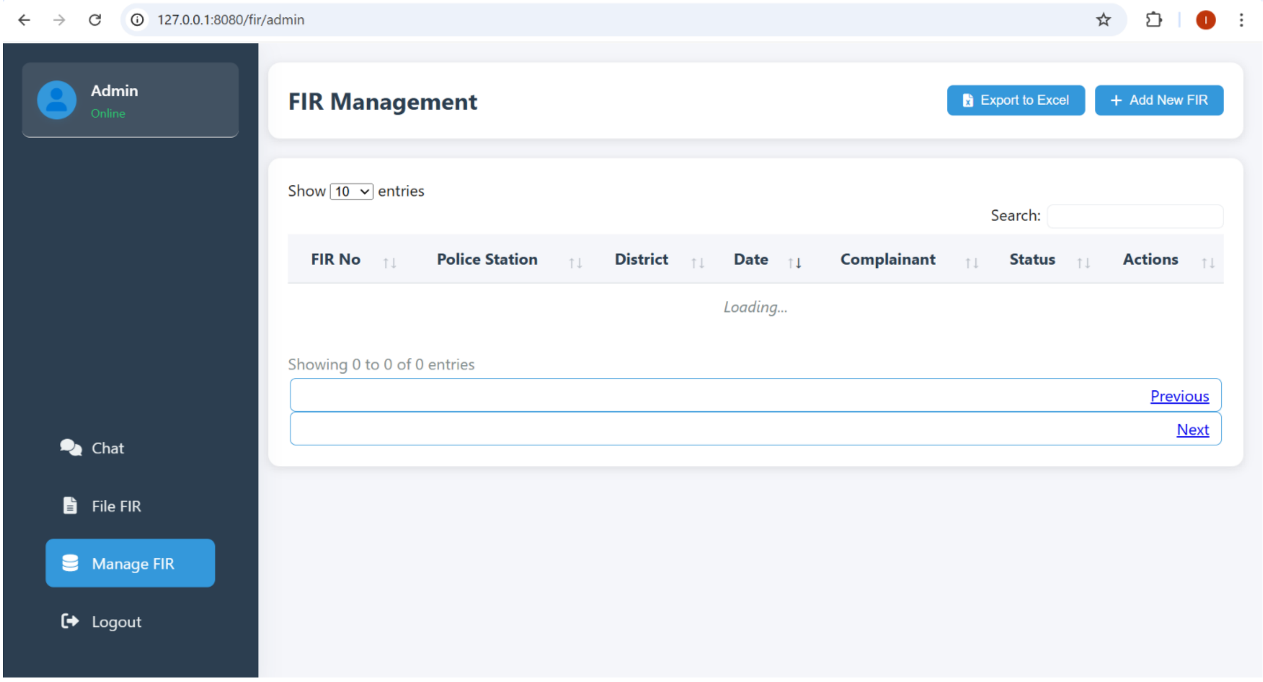
First Information Report (FIR)

Police Station Name: Enter Police Station	FIR Number: Enter FIR No
District: Enter District	Date: dd-mm-yyyy

Complainant / Informant Details

Name: Enter Name	Father's / Mother's Name: Enter Parent's Name

Figure A.5 FIR Page



FIR Management

Show 10 entries

Search:

FIR No	Police Station	District	Date	Complainant	Status	Actions
Loading...						

Showing 0 to 0 of 0 entries

Figure A.6 FIR Database Management

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AI Legal Assistant for Law Enforcement

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ABSTRACT: We introduce in this paper an AI-based Legal Assistant that can assist law enforcement agencies in India. The system applies Natural Language Processing (NLP) to discover applicable sections of the Indian Penal Code (IPC), produce FIRs, and carry out automatic legal referencing. Developed using Rasa, Python, FastAPI, and MySQL, the assistant presents an easy-to-use chatbot interface that improves the accuracy and efficiency of legal operations, particularly during field investigations. The system encourages efficiency, compliance with the law, and transparency during the policing procedure. It illustrates how contemporary technologies can help bridge the distinction between theoretical knowledge of the law and applied enforcement.

KEYWORDS: AI Legal Assistant, Law Enforcement, NLP, FIR Automation, Indian Penal Code, Chatbot, Rasa, FastAPI

I. INTRODUCTION

In the field of law enforcement, every second counts—especially when it comes to responding to crimes, filing reports, and ensuring that legal procedures are followed correctly. However, for many officers, navigating the intricate maze of laws, particularly the Indian Penal Code (IPC), can be overwhelming. Often, officers have to rely on printed manuals, outdated documents, or personal experience to classify crimes and draft FIRs (First Information Reports), which opens the door to mistakes and delays. This becomes even more challenging in areas where access to legal experts or up-to-date references is limited. Recognizing these hurdles, the AI Legal Assistant for Law Enforcement was designed as a practical solution that integrates AI technology with real policing needs. The goal is simple: give officers a smart, reliable, and easy-to-use tool that provides instant legal guidance and automates the tedious parts of paperwork.

This system isn't just a chatbot—it's a powerful support system built with cutting-edge tools like Python, Rasa, MySQL, and FastAPI, tailored to the needs of Indian law enforcement. With this assistant, an officer can describe a crime in plain language and receive detailed legal insights in seconds, including relevant IPC sections and suggested punishments. There's also a built-in FIR generator that organizes the data into a professional, legally compliant report, ready for download. It's designed to work in real-time, keep itself updated with the latest legal changes through web scraping, and provide consistent results regardless of who is using it. By removing guesswork, reducing human error, and simplifying the legal process, this assistant doesn't just save time—it improves the overall quality of policing. It empowers officers to make informed decisions quickly, enhances public trust, and moves us one step closer to a smarter, more digitally connected justice system.

II. PROBLEM STATEMENT

Law enforcement officers often find themselves in situations where they need to quickly interpret and apply the correct sections of the law, especially while documenting crimes or drafting an FIR. Unfortunately, this process is not always straightforward. Many officers still rely on memory, paper-based references, or guidance from colleagues, which can lead to confusion, inconsistencies, or even errors in legal documentation. These challenges become more pronounced in high-pressure situations or in rural areas where access to legal resources or experts is limited. As a result, there's a risk of misclassifying crimes, missing important legal sections, or delaying justice—none of which serve the officer, the victim, or the system well.

Another major hurdle is the manual drafting of FIRs, which is often time-consuming and varies from officer to officer. In the absence of a standardized, guided process, there can be missing details or non-compliance with legal formats, which may affect the strength of a case in court. With the number of cases increasing and officers juggling multiple responsibilities, the need for a tool that simplifies legal referencing and automates routine documentation has become more urgent than ever. An AI-powered legal assistant can fill this gap by offering instant legal clarity and helping officers generate accurate, structured FIRs—ultimately reducing their workload and improving the overall efficiency of the justice system.

III. LITERATURE REVIEW

1. Author: Selvi, A., Mounika, V., Rubika, V., & Uvadharanee, B.

Title: COLLEGEBOT: Virtual Assistant System for Enquiry Using Natural Language Processing (2024)
Outcome: This study introduced a virtual assistant designed to handle college-related inquiries using NLP. It allowed users to ask questions in natural language and get relevant responses, improving user interaction and reducing administrative effort.
Disadvantage: Although useful in academic environments, it doesn't handle more complex, legal-specific queries or integrate with structured legal databases, limiting its usefulness in law enforcement applications.

2. Author: Suresh, A. & Kumar, R.

Title: Artificial Intelligence in Legal Decision-Making: Opportunities and Challenges (2023)
Outcome: This paper explored how AI can support legal decision-making, especially in analyzing case data and recommending outcomes. It highlighted benefits like improved efficiency and reduction of human error in legal analysis.
Disadvantage: The paper also pointed out concerns about bias in AI models, ethical issues, and the difficulty in ensuring full transparency in automated legal decisions.

3. Author: Kumar, P. & Raj, M.

Title: An AI-Based Framework for Crime Classification and Legal Advice Generation (2022)
Outcome: This research proposed a framework that uses AI to classify types of crimes and suggest legal advice. It supports faster legal analysis and helps officers identify applicable sections of law based on the description of incidents.
Disadvantage: While the system offers accurate classification, it still depends on clean input data and struggles with ambiguous or incomplete crime descriptions, which are common in real-world police work.

4. Author: Patel, N. & Sharma, M.

Title: Legal Document Analysis using NLP Techniques (2021)
Outcome: The authors showcased how NLP can be applied to analyze and extract key elements from legal documents, making legal research and document classification more efficient.
Disadvantage: Despite its effectiveness in legal text processing, the system is more suited for static document analysis rather than dynamic, interactive use cases like FIR generation or real-time query answering.

5. Author: Kim, H. et al.

Title: LAPIS: Language Model-Augmented Police Investigation System (2024)
Outcome: LAPIS leverages large language models to help police officers with document analysis, legal provision suggestions, and workflow improvements. It supports smarter investigations and better use of data.
Disadvantage: The system requires significant computational resources and might be challenging to deploy in smaller police departments with limited infrastructure.

6. Author: Tewari, A.

Title: LegalPro-BERT: Classification of Legal Provisions by Fine-Tuning BERT Large Language Model (2024)
Outcome: This paper introduces a BERT-based model fine-tuned specifically for legal text classification. It achieves high accuracy in identifying relevant legal provisions and can be integrated into automated legal tools.
Disadvantage: While powerful, it demands high-quality training data and fine-tuning. Performance may drop if applied to domains it wasn't specifically trained for, such as regional laws or niche legal topics.

7. Author: Ariai, F. & Demartini, G.

Title: Natural Language Processing for the Legal Domain: A Survey of Tasks, Datasets, Models, and Challenges (2024)
Outcome: This comprehensive survey reviews current NLP techniques used in legal AI systems. It offers valuable insights into the challenges, tools, and models suited for legal tasks such as document summarization and statute extraction.
Disadvantage: While informative, it is theoretical and lacks implementation details. The paper serves more as a roadmap than a practical guide for building real-time, law enforcement-focused AI tools.

8. Author: Bhattacharya, P., et al.

Title: "Legal Judgment Prediction Using Machine Learning Models in Indian Penal Code Cases" (2023)
Outcome: This study focuses on predicting judicial outcomes using machine learning models based on past IPC case data. It highlights how AI can analyze legal arguments and case details to assist judges and legal officers in making data-driven decisions.
Disadvantage: The system is trained on structured legal judgments, making it less adaptable to frontline law enforcement scenarios where input data is often unstructured and incomplete.

9. Author: Ramesh, K. & Dutta, A.

Title: "Smart FIR System Using AI and Natural Language Processing" (2022)
Outcome: The authors propose an AI-based FIR automation system that takes user input through voice or text, extracts key crime-related details using NLP, and generates a structured FIR. This aligns closely with the goal of reducing manual effort in FIR creation.
Disadvantage: The system lacks real-time legal referencing and doesn't validate the legal accuracy of the FIR, which is crucial for legal compliance and admissibility in court.

10. Author: Jain, V., & Mehta, S.

Title: "Crime Type Classification and Section Mapping using Text Mining Techniques" (2021)
Outcome: This paper introduces a method that classifies crimes based on incident descriptions and maps them to corresponding IPC sections using text mining. It emphasizes how classification can improve the efficiency of FIR filing.
Disadvantage: While the classification accuracy is promising, it doesn't incorporate a conversational interface or provide dynamic user interaction, limiting its real-time applicability for field officers.

IV. DESIGN AND IMPLEMENTATION

The AI Legal Assistant system is designed to provide an intuitive, efficient, and reliable platform to support law enforcement officers by offering instant legal guidance and automated FIR generation. The system architecture follows a modular design, allowing various components—such as user interaction, natural language understanding, database querying, and legal document generation—to work cohesively while remaining independently maintainable and scalable.

System Architecture Overview

At the core, the system uses a client-server model. The user interacts with a web-based chat interface that connects to a backend server via WebSockets, enabling real-time message exchange. The backend uses Rasa for natural language processing (NLP), which interprets user queries by identifying intent and extracting relevant legal entities. Depending on the query, the backend either retrieves data from a MySQL legal database or generates a generic response. This approach ensures that law enforcement personnel receive quick, accurate, and legally compliant information.

Activity Diagram

The Activity Diagram below illustrates the stepwise flow of user interaction with the AI Legal Assistant:

Stepwise Explanation:

1. User opens webpage: The user accesses the AI Legal Assistant through a web browser.
2. Initialize chat interface: The chatbot interface is set up and ready for input.
3. Connect to WebSocket: The client establishes a WebSocket connection to enable real-time communication with the server.
4. User sends query: The user types a question or crime description into the chat window.
5. Display query: The user's message is shown on the interface for clarity.
6. Send to NLP backend: The message is forwarded to the Rasa NLP backend for processing.
7. Parse intent & entities: The NLP engine identifies the user's intent (e.g., crime query, legal section info) and extracts entities such as crime names or IPC sections.
8. Needs database?: A decision point determines if the query requires data retrieval from the legal database.
   - If yes, the system queries the MySQL database for relevant legal information and formats it for the user.
   - If no, it generates a generic response (e.g., greetings, help instructions).
9. Send response to user: The system sends the formulated reply back to the user.
10. Show formatted response: The user sees a clear, formatted answer in the chat interface.

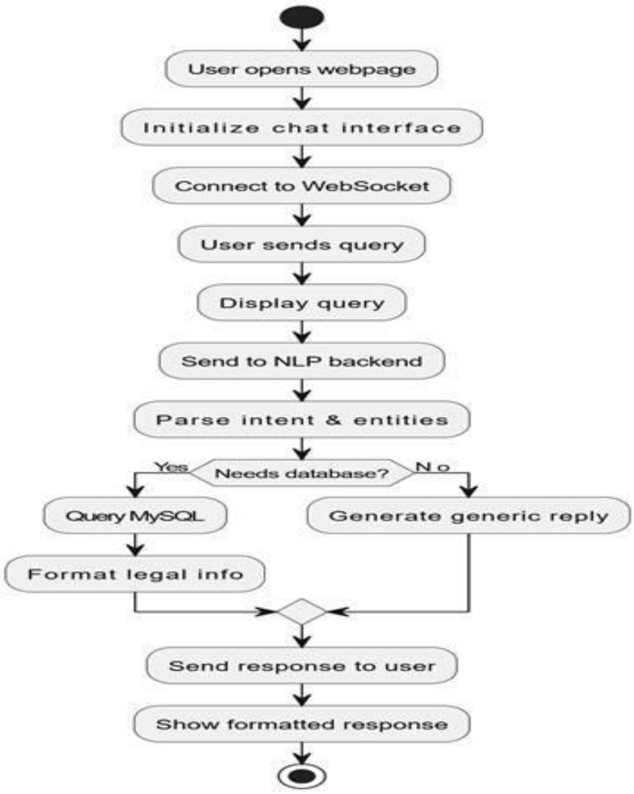

Fig. 1. Activity Diagram of the Legal Query Flow

This flow ensures seamless, real-time interactions that help officers get accurate legal information quickly, reducing delays and improving case handling.

Use Case Diagram

The Use Case Diagram shows the various responsibilities and actions performed by the system administrator (Admin) in maintaining and managing the AI Legal Assistant system:

Roles and Actions:

- Authenticate: Admin logs into the system securely to access management features.
- Manage Legal Database: Admin updates, adds, or deletes IPC sections, crime categories, and punishments to ensure the database remains current.
- Monitor System Logs: Admin reviews logs for system performance, error tracking, and security auditing.
- Train NLP Models: Admin retrains or fine-tunes the Rasa conversational models to improve chatbot understanding and accuracy.
- Configure WebSocket Server: Admin manages real-time communication configurations ensuring smooth, continuous user interaction.
- Update IPC Sections and Crimes: Admin incorporates new legal amendments or crime classifications into the system.
- Deploy NLP Model: Admin deploys updated models after training to keep the chatbot's knowledge current.
- Perform System Backup: Admin regularly backs up system data and models to prevent data loss and ensure quick recovery.

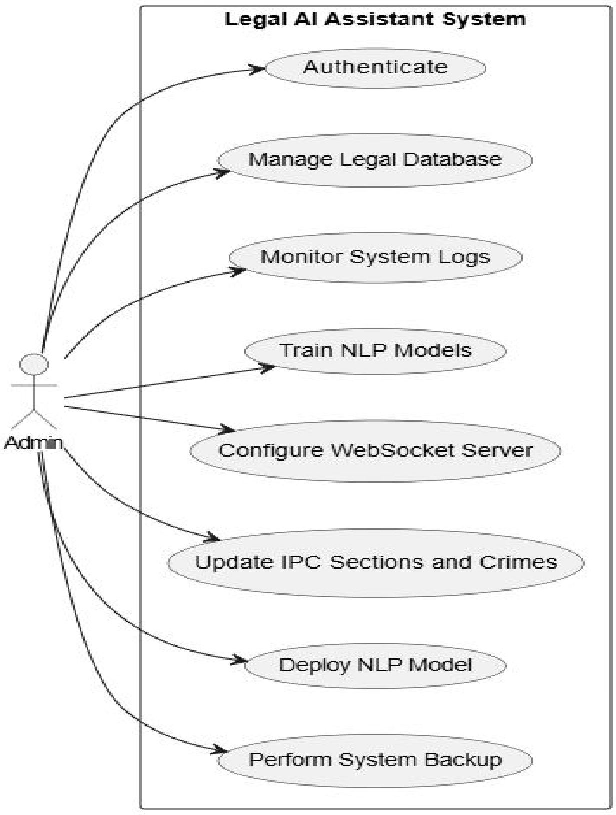

Fig. 2. Use Case Diagram for Query Handling

This diagram clarifies the administrative functions essential for the AI Legal Assistant's reliability, security, and continuous improvement.

Implementation Details

- Frontend Development: The user interface is built using HTML, CSS, and JavaScript with Jinja2 templating, providing a responsive and user-friendly chat experience.
- Backend Development: FastAPI handles API endpoints, WebSocket connections, and integration with Rasa for NLP processing.
- NLP Engine: Rasa interprets user inputs, identifies intents (e.g., crime query, FIR drafting), extracts entities (e.g., crime type, IPC section), and triggers appropriate responses.
- Database: A structured MySQL database holds validated IPC sections, crime descriptions, punishments, and complaint records.
- FIR Generation: User inputs through the interface are compiled into a legally formatted FIR, generated as a downloadable PDF.
- Real-Time Communication: WebSocket protocol ensures users receive instantaneous responses without needing to refresh the webpage.
- Security Measures: User authentication and encrypted connections secure sensitive legal data and user interactions.

By combining these components, the AI Legal Assistant delivers a powerful tool that simplifies legal referencing, automates documentation, and supports law enforcement officers in making informed decisions efficiently.

V. CONCLUSION

The AI Legal Assistant for Law Enforcement represents a significant step forward in harnessing technology to support the demanding and complex work of police officers. By integrating artificial intelligence and natural language processing, the system effectively bridges the gap between legal knowledge and frontline law enforcement needs. It offers officers instant access to accurate legal information and automates the creation of First Information Reports, tasks that traditionally have been time-consuming and prone to human error. This not only speeds up the investigative process but also improves the overall quality and consistency of legal documentation, helping to ensure justice is served more efficiently.

Beyond its immediate practical benefits, the system also reflects a broader vision of modernizing policing through digital innovation. By reducing the cognitive load on officers and providing real-time, reliable legal support, the AI Legal Assistant empowers law enforcement personnel to focus more on critical decision-making and community engagement. Its scalable design and modular architecture make it adaptable to future enhancements, such as multilingual support and integration with national legal databases. Overall, this project demonstrates the powerful role AI can play in transforming traditional law enforcement workflows into smarter, more transparent, and citizen-friendly processes that better serve both officers and the public.

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APPENDIX B

PAPER PUBLICATION DETAILS

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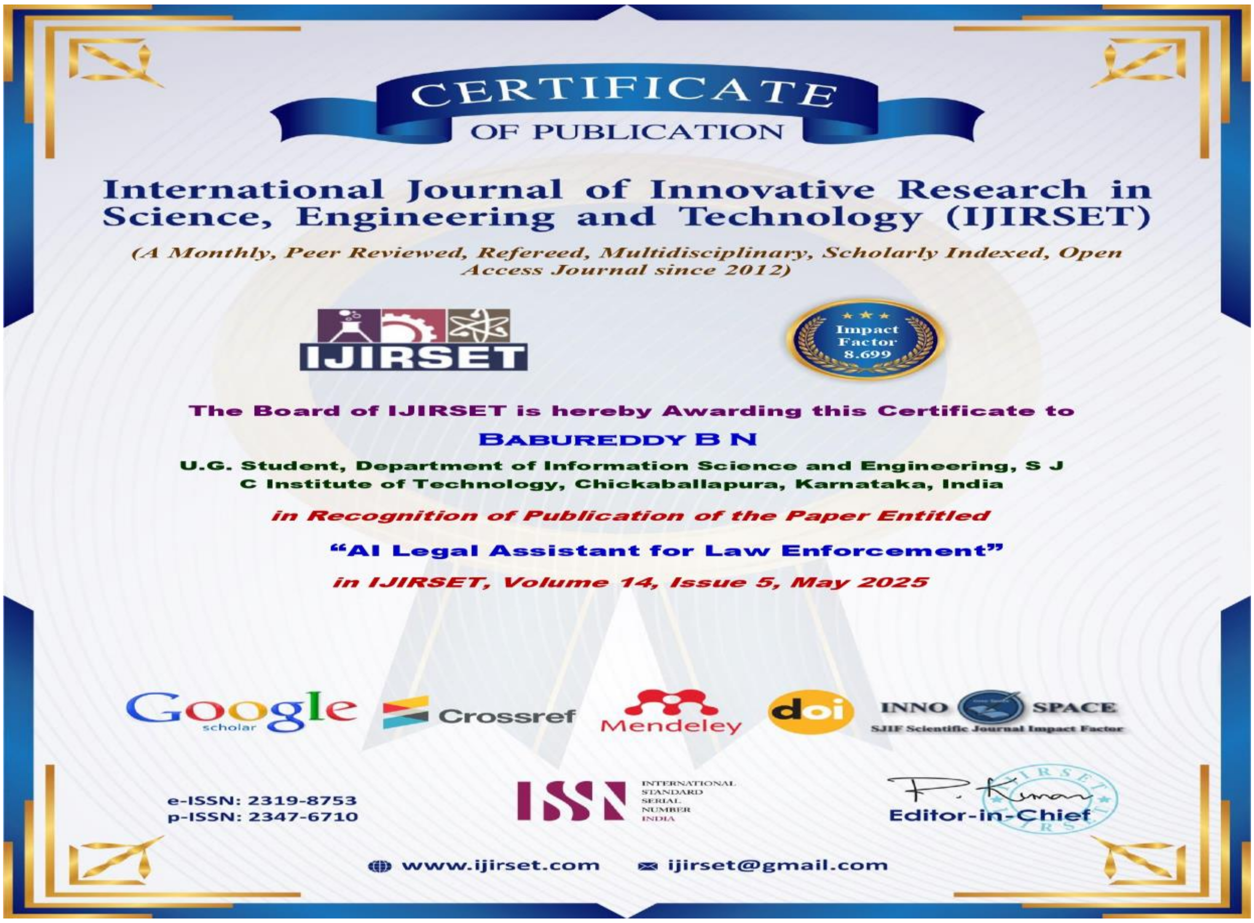

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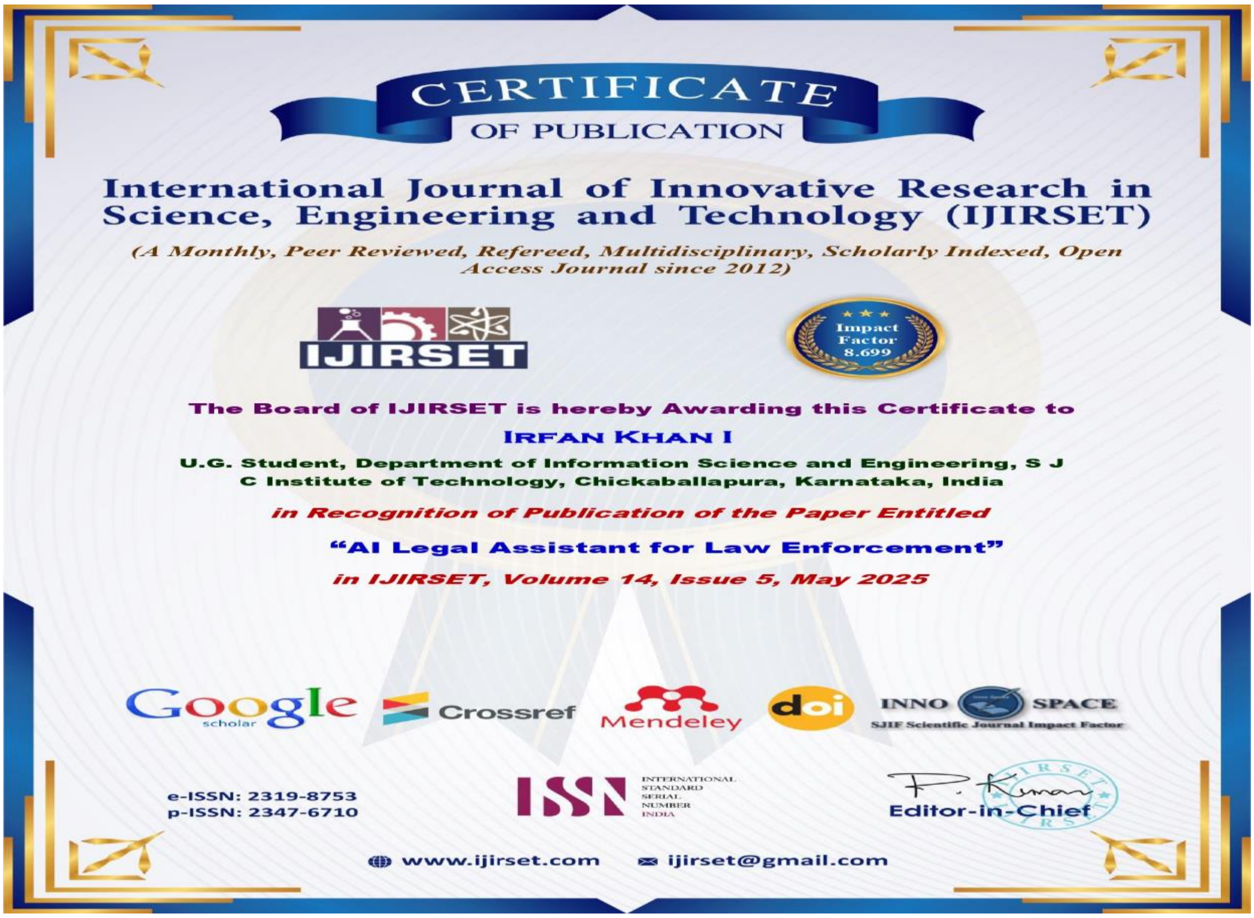

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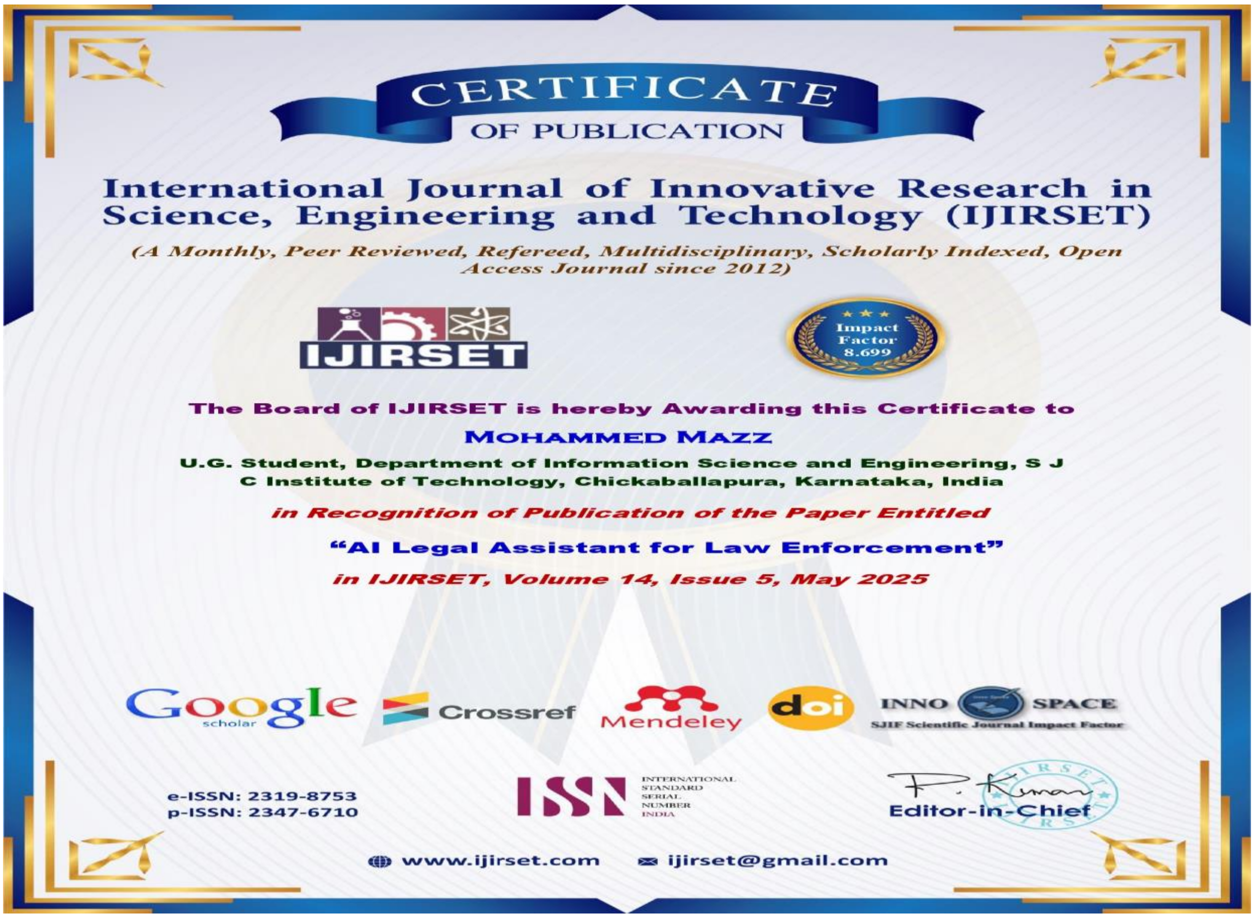

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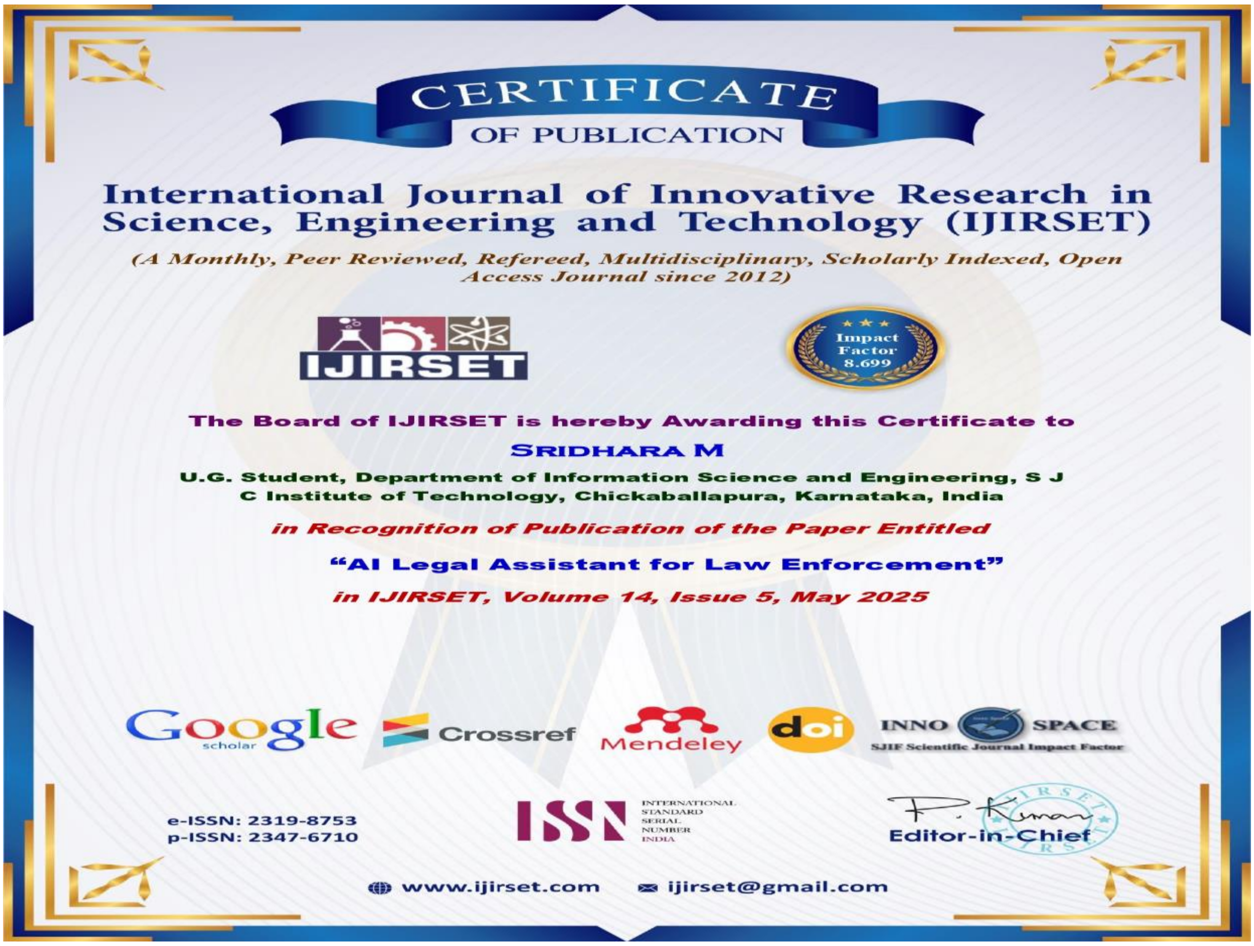

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