

AI APP FOR LAWYER RECOMMENDATION

A PROJECT REPORT

Submitted by

RITHIKA M (210701214)

RUPESH L (210701217)

SHARVESH R (210701244)

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BONAFIDE CERTIFICATE

Certified that this thesis titled “**AI APP FOR LAWYER RECOMMENDATION**” is the bonafide work of “**RITHIKA M (210701214), RUPESH L (210701217), R SHARVESH (210701244)**” who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE

Mr. Vijay K, B.Tech., M.E.,

Assistant Professor (SG)

PROJECT COORDINATOR

Department of Computer Science and Engineering

Rajalakshmi Engineering College

Chennai - 602 105

Submitted to Project Viva-Voce Examination held on _____

Internal Examiner

External Examiner

ABSTRACT

This project endeavors to develop an AI-driven system for lawyer assignment, utilizing advanced machine learning techniques like Natural Language Processing (NLP) and predictive modeling. The core objective is to create a sophisticated platform capable of intelligently matching legal queries with appropriate lawyers, thereby facilitating efficient lawyer-client assignments. Through comprehensive training and iterative refinement, the system aims to evolve its decision-making capabilities and adapt its recommendations to varying legal contexts. Python serves as the primary programming language, with NLP libraries and predictive modeling algorithms integrated to analyze and process legal data. The project underscores the significance of continuous optimization and adaptation to enhance the system's accuracy and effectiveness. By harnessing the power of AI, this endeavor seeks to revolutionize traditional legal practices, offering a promising avenue for optimizing lawyer-client interactions and enhancing overall legal service delivery.

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RITHIKA M (210701214)

RUPESH L (210701217)

SHARVESH R (210701244)

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In a world where legal complexity is on the rise and the need for accessible legal services is on the rise, the integration of Artificial Intelligence (AI) is a sign of hope in the ever-changing legal landscape. We are proud to introduce the AI-powered Lawyer Assignment System. This system is designed to bridge the gap between the need for legal representation and the limited number of lawyers available.

The AI-powered system uses advanced NLP (Natural Language Processing) algorithms and ML (Machine Learning) models to answer complex legal questions and provide tailored answers quickly and accurately. Whether it's explaining the complexities of legal processes or predicting the cost of a particular legal case, the system is ready to provide you with the guidance you need at every stage.

In today's dynamic legal landscape, securing legal representation poses significant challenges, exacerbated by the scarcity of available lawyers and the prohibitive costs associated with their services. Thousands of cases are reported daily, amplifying the stress of navigating through the limited pool of legal professionals to find one that aligns with both the individual's needs and financial constraints. Recognizing this pressing issue, the AI-Powered Lawyer Assignment System emerges as a beacon of hope, leveraging advanced technologies to streamline the lawyer-client matching process.

Through intuitive interfaces and streamlined workflows, users can initiate and complete their legal proceedings with unprecedented ease, obviating the need for cumbersome paperwork and protracted waiting times. Moreover, stringent security protocols ensure the sanctity of user data and adherence to privacy regulations, thereby fortifying user

confidence and engendering a sense of assurance in their interactions with the platform.

By leveraging Natural Language Processing and Machine Learning algorithms, the system predicts the cost bracket for legal services based on the type of crime and the location of the incident, offering a promising solution to the pressing issue of legal representation in today's time and age.

1.2 PROBLEM STATEMENT

The project aims to develop an AI-driven system for lawyer assignment, using advanced machine learning techniques like Natural Language Processing (NLP) and predictive modeling. The goal is to efficiently match clients with suitable lawyers based on factors such as legal expertise, location, and cost constraints. By analyzing legal queries and predicting costs, the AI will recommend the most appropriate lawyer for each case, enhancing transparency and accessibility in the legal domain.

1.3 SCOPE OF THE WORK

The AI-driven lawyer assignment system represents a multifaceted endeavor with broad-reaching implications. The project extends its scope to encompass a wide range of stakeholders and applications. Its primary audience includes individuals seeking efficient legal assistance, legal professionals navigating caseloads, and organizations grappling with legal complexities. Moreover, the system's versatility allows for integration into various sectors, such as governmental agencies, legal firms, and educational institutions, where it can serve as a model for streamlining legal processes. Despite challenges related to data management and algorithm optimization, the system's adaptability and potential for innovation offer promising avenues for future development and expansion.

1.4 AIM AND OBJECTIVES OF THE PROJECT

The primary objective of this project is to create an AI-driven system for lawyer assignment, using advanced machine learning techniques like Natural Language Processing (NLP) and predictive modeling. The aim is to efficiently match clients with suitable legal representation by analyzing legal queries and predicting the cost implications of legal services.

Furthermore, the project aims to develop predictive models capable of estimating the cost implications of legal services based on various factors, including the nature of the legal issue and geographical context.

Moreover, the project aims to incorporate mechanisms for continuous improvement, allowing the system to adapt and evolve in response to user feedback and changing legal dynamics. By fulfilling these objectives, the project aims to revolutionize the legal domain, enhancing transparency, accessibility, and efficiency in lawyer-client interactions.

1.5 RESOURCES

The project has been driven by extensive secondary research, drawing upon accredited manuscripts, standard papers, business journals, white papers, analyst insights, and conference reviews. Given the complexity of the task, considerable resources are necessary for its successful completion.

Outlined below are the key resources crucial for the project's execution:

1.5.1 Adequately equipped workstations (PCs, laptops, etc.) to conduct research and gather relevant materials efficiently.

1.5.2 Access to unlimited internet connectivity to explore and retrieve online resources is

essential for the project.

1.5.3 Unrestricted entry to university facilities, particularly the laboratory, facilitating access to a diverse range of literature, including academic resources (e.g., tutorials, programming examples, bulletins, publications, e-books, journals), and technical manuscripts.

1.6 MOTIVATION

The core motivation behind this project lies in exploring the application of advanced machine learning techniques, particularly NEAT (Neuro Evolution of Augmenting Topologies), in the legal domain. By harnessing NEAT, the project aims to develop an AI-driven system for lawyer assignment that can autonomously learn, adapt, and refine its strategies over time.

Furthermore, the project is driven by the desire to create an adaptive AI system capable of dynamically adjusting its decision-making processes based on real-world legal scenarios. By showcasing the AI's ability to learn from past experiences and adapt its strategies accordingly, the project aims to demonstrate the potential of NEAT-driven evolution in revolutionizing the legal landscape.

CHAPTER 2

LITERATURE SURVEY

1.The European Commission's proposal for an Artificial Intelligence Act—a critical assessment by members of the Robotics and AI Law Society (RAILS)

M Ebers, VRS Hoch, F Rosenkranz, H Ruschemeier... - J (2021)

Biometric facial recognition is an artificial intelligence technology involving the automated comparison of facial features, used by law enforcement to identify unknown suspects from photographs and closed circuit television. Its capability is expanding rapidly in association with artificial intelligence and has great potential to solve crime. However, it also carries significant privacy and other ethical implications that require law and regulation. This article examines the rise of biometric facial recognition, current applications and legal developments, and conducts an ethical analysis of the issues that arise. Ethical principles are applied to mediate the potential conflicts in relation to this information technology that arise between security, on the one hand, and individual privacy and autonomy, and democratic accountability, on the other. These can be used to support appropriate law and regulation for the technology as it continues to develop.

2.Smith, Marcus, and Seumas Miller. "The ethical application of biometric facial recognition technology." *Ai & Society* 37, no. 1 (2022)

Biometric facial recognition is an artificial intelligence technology involving the automated comparison of facial features, used by law enforcement to identify unknown suspects from photographs and closed circuit television. Its capability is expanding rapidly in association with artificial intelligence and has great potential to solve crime. However, it also carries significant privacy and other ethical implications that require law and regulation. This article examines the rise of biometric facial recognition, current applications and legal developments, and conducts an ethical analysis of the issues that arise. Ethical principles are applied to mediate the potential conflicts in relation to this

information technology that arise between security, on the one hand, and individual privacy and autonomy, and democratic accountability, on the other. These can be used to support appropriate law and regulation for the technology as it continues to develop.

3.Cowls, Josh, Andreas Tsamados, Mariarosaria Taddeo, and Luciano Floridi. "The AI gambit: leveraging artificial intelligence to combat climate change—opportunities, challenges, and recommendations." *Ai & Society* (2023)

Analyse the role that artificial intelligence (AI) could play, and is playing, to combat global climate change. We identify two crucial opportunities that AI offers in this domain: it can help improve and expand current understanding of climate change, and it can contribute to combatting the climate crisis effectively. However, the development of AI also raises two sets of problems when considering climate change: the possible exacerbation of social and ethical challenges already associated with AI, and the contribution to climate change of the greenhouse gases emitted by training data and computation-intensive AI systems.

4.Fui-Hoon Nah, Fiona, Ruilin Zheng, Jingyuan Cai, Keng Siau, and Langtao Chen. "Generative AI and ChatGPT: Applications, challenges, and AI-human collaboration." *Journal of Information Technology Case and Application Research* 25, no. 3 (2023)

Artificial intelligence (AI) has elicited much attention across disciplines and industries (Hyder et al., Citation2019). AI has been defined as “a system’s ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation” (Kaplan & Haenlein, Citation2019, p. 15). AI has gone through several development stages and AI winters. In the first two decades (i.e., 1950s and 1960s), AI demonstrated success which included programs such as General Problem Solver (Newell et al., Citation1959) and ELIZA (Weizenbaum, Citation1966). However, limitations in processing capacity and reduced spending on AI turned its development into stagnation.

5.Smuha, Nathalie A. "From a 'race to AI'to a 'race to AI regulation': regulatory competition for artificial intelligence." Law, Innovation and Technology 13, no. 1 (2021)

Against a background of global competition to seize the opportunities promised by Artificial Intelligence (AI), many countries and regions are explicitly taking part in a 'race to AI'. Yet the increased visibility of the technology's risks has led to ever-louder calls for regulators to look beyond the benefits, and also secure appropriate regulation to ensure AI that is 'trustworthy' – i.e. legal, ethical and robust. Besides minimising risks, such regulation could facilitate AI's uptake, boost legal certainty, and hence also contribute to advancing countries' position in the race. Consequently, this paper argues that the 'race to AI' also brings forth a 'race to AI regulation'. After discussing the regulatory toolbox for AI and some of the challenges that regulators face when making use thereof, this paper assesses to which extent regulatory competition for AI – or its counterpart, regulatory convergence – is a possibility, a reality and a desirability.

6.Kunduru, Arjun Reddy. "Recommendations to advance the cloud data analytics and chatbots by using machine learning technology." International Journal of Engineering and Scientific Research 11, no. 3 (2023)

The selection of machine learning tools for data analytics might be challenging due to the ever-growing

number of alternatives. The various tools each have benefits and limitations, and many of their applications

overlap. The amount of data in the globe is expanding quickly, and as we transition to distributed and realtime processing, conventional machine learning methods are becoming inadequate. This study is designed to

help researchers or professionals who are knowledgeable about machine learning but have no background in

data analytics and chatbots.

7.Gulyamov, Said, and Mokhinur Bakhramova. "Digitalization of international arbitration and dispute resolution by artificial intelligence." *World Bulletin of Management and Law* 9 (2022)

The first (human) is focused on effective decision making. On the contrary, the latter seeks to help people make decisions or even to replace people as decision makers. This is the central part of the research question we are studying ("What is Arbitration?"). When it comes to artificial intelligence applications for arbitration, we especially look at applications that help arbitrators perform their arbitration functions or ultimately assume these functions.

8.Uddin, Mahatab, Ataharul Chowdhury, and Muhammad Ashad Kabir. "Legal and ethical aspects of deploying artificial intelligence in climate-smart agriculture." *AI & SOCIETY* 39, no. 1 (2024)

The ethical concerns were further examined based on criminal law, tort law, privacy and data protection law, and intellectual property law. In this regard, the study finds that the current tort law pattern is more suitable than the criminal law pattern to address some major ethical concerns, such as data inaccuracy and other technical errors based on wrong recommendations or wrongful acts.

9.Floridi, Luciano. "The European Legislation on AI: A brief analysis of its philosophical approach." *Philosophy & Technology* 34, no. 2 (2021)

Some European legislation on artificial intelligence (AI) had been expected at least since 16 July 2019. On that date, Ursula von der Leyen had pledged that, within 100 days of her election as President of the European Commission, she would have proposed new legislation on AI.^{Footnote1} At that time, I remarked that it was a reasonable strategy but an unrealistic timeline. The High-Level Expert Group on AI (HLEG, of which I was a member),^{Footnote2} organised by the European Commission, had only recently published its Ethics Guidelines for Trustworthy AI (HLEGAI, 2019) and its Policy and Investment Recommendations for Trustworthy AI (HLEGAI, 2019).

CHAPTER 3

SYSTEM DESIGN

3.1 GENERAL SYSTEM DESIGN

In this section, we aim to elucidate how the various components operate synergistically when organized and arranged together. This holistic integration is visually represented through a flowchart presented below, offering a comprehensive understanding of the interconnected workflow.

3.2 SYSTEM ARCHITECTURE DIAGRAM

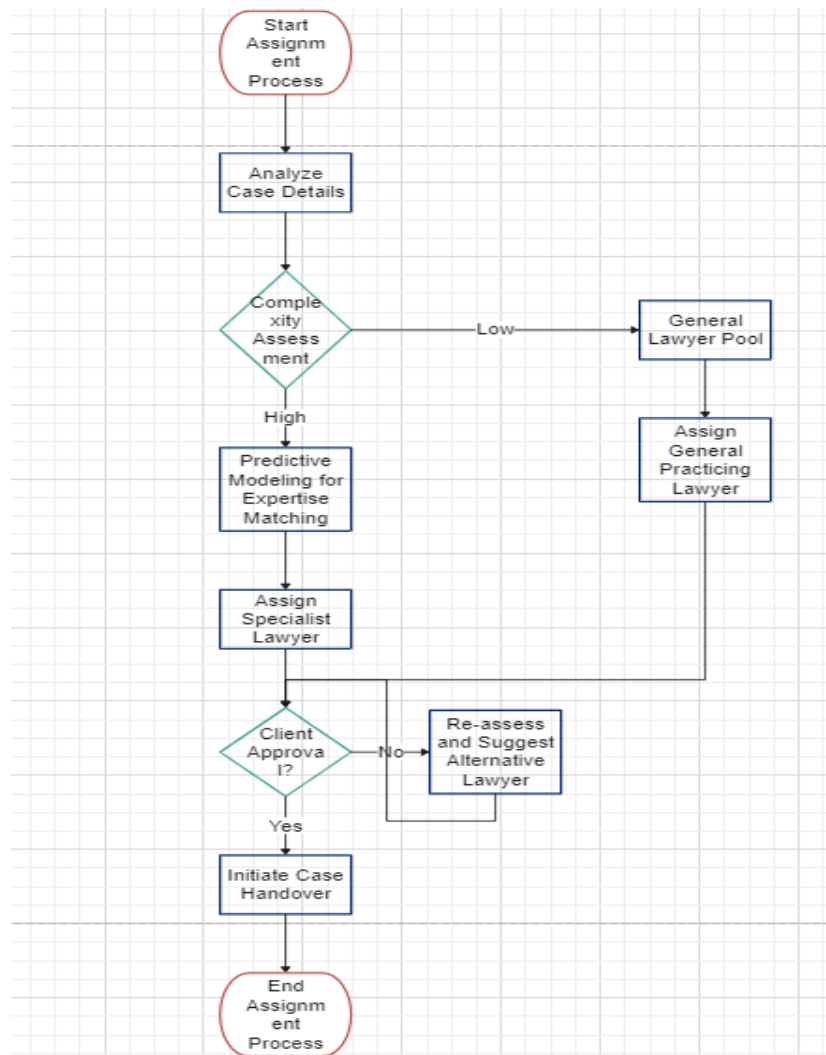


Fig 3.2(a) System Architecture

3.3 DEVELOPMENTAL ENVIRONMENT

Requirement analysis for this project involves both Hardware and Software Components that are listed in the following subsections.

3.3.1 HARDWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the system's implementation. It should therefore be a complete and consistent specification of the entire system. It is generally used by software engineers as the starting point for the system design. It is listed in Table 3.3.1 below.

COMPONENTS	SPECIFICATION
PROCESSOR	Intel Core i5
RAM	8 GB RAM
GPU	NVIDIA GeForce GTX 1650
MONITOR	15" COLOR
HARD DISK	512 GB
PROCESSOR SPEED	MINIMUM 1.1 GHz

Table 3.3(a) Hardware Requirements

3.3.2 SOFTWARE REQUIREMENTS

The software requirements document is the specifications of the system. It should include both a definition and a specification of requirements. It is a set of what the system should rather be doing than focus on how it should be done. The software requirements provide

a basis for creating the software requirements specification. It is useful in estimating the cost, planning team activities, performing tasks, tracking the team, and tracking the team's progress throughout the development activity. **Python IDLE** and **Chrome Browser** would all be required.

3.3.3 DESIGN OF THE ENTIRE SYSTEM

SEQUENCE DIAGRAM

The sequence diagram outlines the operation of our AI-powered lawyer assignment system, commencing with clients submitting legal queries, which are then processed using preprocessing techniques and NLP. Predictive modeling aids in matching queries with lawyers from a legal database, with assigned lawyers promptly notified. Upon acceptance, clients receive confirmation of the assignment, initiating legal proceedings. Continuous monitoring and performance evaluations are conducted throughout, integrating feedback from clients and lawyers to enhance system efficiency. The sequence diagram of the proposed system is shown in Figure 3.3.2 below.

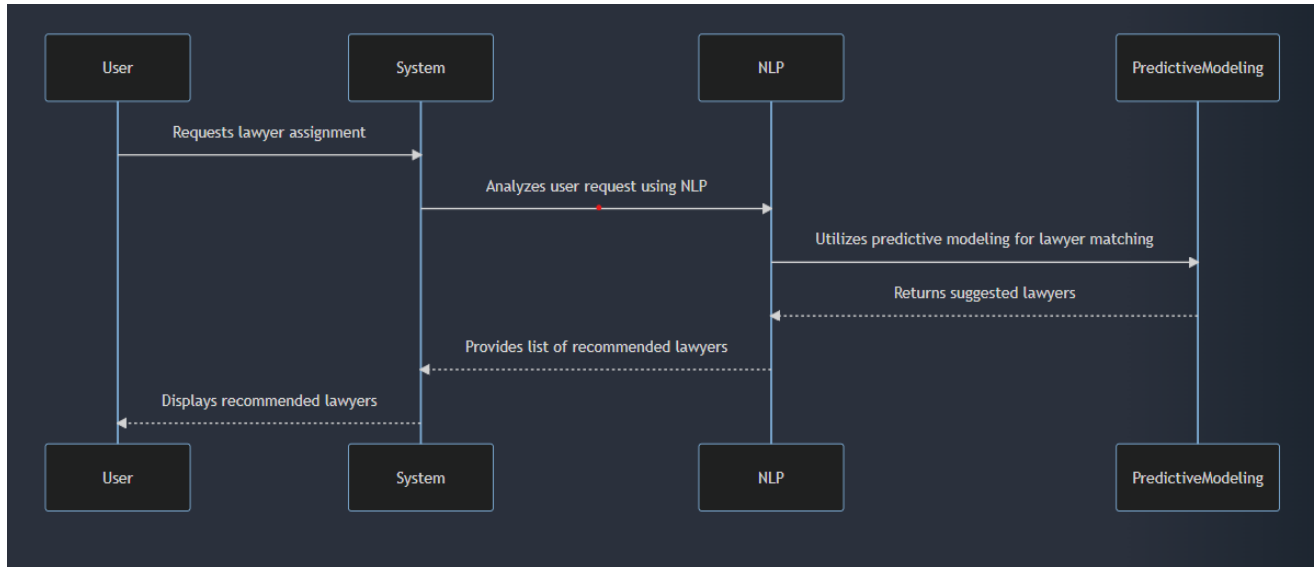


Figure 3.3(b) Sequence Diagram

CHAPTER 4

PROJECT DESCRIPTION

4.1 METHODOLOGY

In developing an AI-driven system for lawyer assignment, employing advanced machine learning techniques such as Natural Language Processing (NLP) and predictive modeling, our approach parallels that outlined in the paper "Advancing Autonomous Driving with Large Language Models: Integration and Impact."

A substantial dataset of legal scenarios is amassed to train the AI model, ensuring comprehensive coverage of diverse legal contexts. Although lacking in sensor-rich data, the dataset furnishes critical information on legal dynamics, case variations, and procedural nuances, pivotal for the AI model's training.

Integration entails leveraging large language models to interpret the abstracted legal data. Extensive training on diverse datasets enables the AI model to decipher high-level legal dynamics and render informed decisions. This training encompasses not only raw data but also contextual and behavioral cues to simulate real-world legal scenarios faithfully.

Given the absence of direct sensory inputs, such as case precedents or legal doctrines akin to lidar or radar in autonomous driving, the AI model's role becomes paramount. It must extrapolate requisite details from the available state representations to execute accurate and judicious lawyer assignments.

The system architecture heavily relies on the AI model's capacity to process abstracted legal data and generate appropriate assignment recommendations, thus facilitating efficient and effective lawyer allocation within the legal domain.

CHAPTER 5

MODULES

5.1 MODULE DESCRIPTION

Our project prioritizes a commitment to continuous learning, recognizing its pivotal role in comprehensive professional growth. Our module aims to cultivate a versatile skill set crucial for success in today's dynamic environment. It underscores the development of critical thinking, problem-solving, and adaptability, empowering individuals to navigate complexities and foster innovation within their respective fields. Moreover, we stress the importance of staying updated with the latest advancements, facilitating the ongoing enhancement of expertise and ensuring competitiveness. Additionally, effective communication, collaboration, and leadership abilities are emphasized, fostering meaningful interactions and facilitating career progression. Through our dedication to lifelong learning, our module empowers individuals to continually evolve, contribute meaningfully, and excel in an ever-changing global landscape.

5.2 MODULES

The various modules in the Lawyer Recommendation System using Machine Learning is shown as below.

5.2.1 Selection Module

A module that lets you choose your location from where you are browsing or from where you need help and another module that focuses on the type of crime committed against you.

5.2.1.1 Location Selection

This module lets you select a city through a dropdown that consists of all major cities and villages in India. You can choose your own city or a city from which you want a lawyer. This is shown in Figure 5.2.1 below.

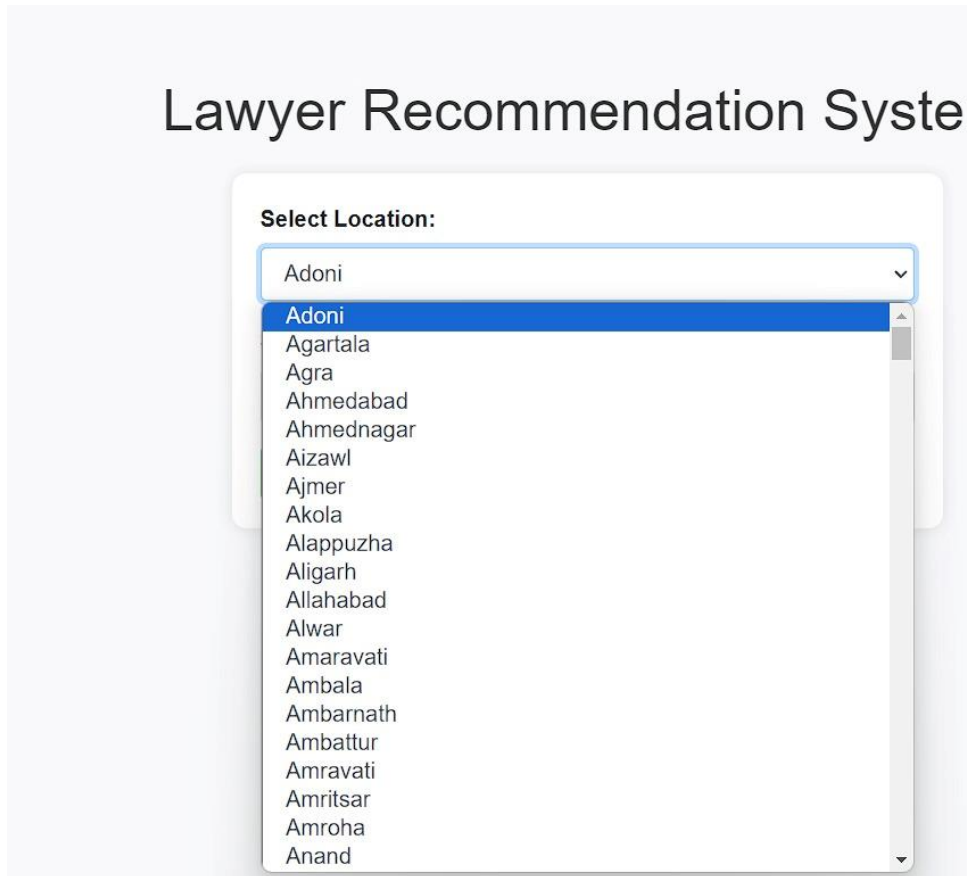


Figure 5.2(a) Location Selection

5.2.1.2 Expertise Selection

This module lets you choose lawyers based on their area of expertise and the area where you need assistance. This ranges from Business Law to Real Estate Law as shown in Figure 5.2.2 below.

Lawyer Recommendation System

Select Location:

Adoni ▼

Select Expertise:

Business Law ▼

Business Law

Criminal Defense Law

Employment Law

Environmental Law

Family Law

Immigration Law

Intellectual Property Law

Medical Malpractice Law

Personal Injury Law

Real Estate Law

Figure 5.2(b) Expertise Selection

5.2.2 Recommendation Module

This module produces a list of lawyers based on the preferred city and area of expertise selected in the previous module to choose from. Users can choose any lawyer from the list of lawyers presented based on their liking or preference as shown in Figure 5.2.3 below.

Recommended Lawyers				
Predicted Price(in ₹): 23956.24				
Lawyer Name	Location	Expertise	Fees in ₹	Rating (Out of 5)
Raghav Goswami	Adoni	Family Law	17872	3.7
Back to Home				

Figure 5.2(c) Recommended Lawyers

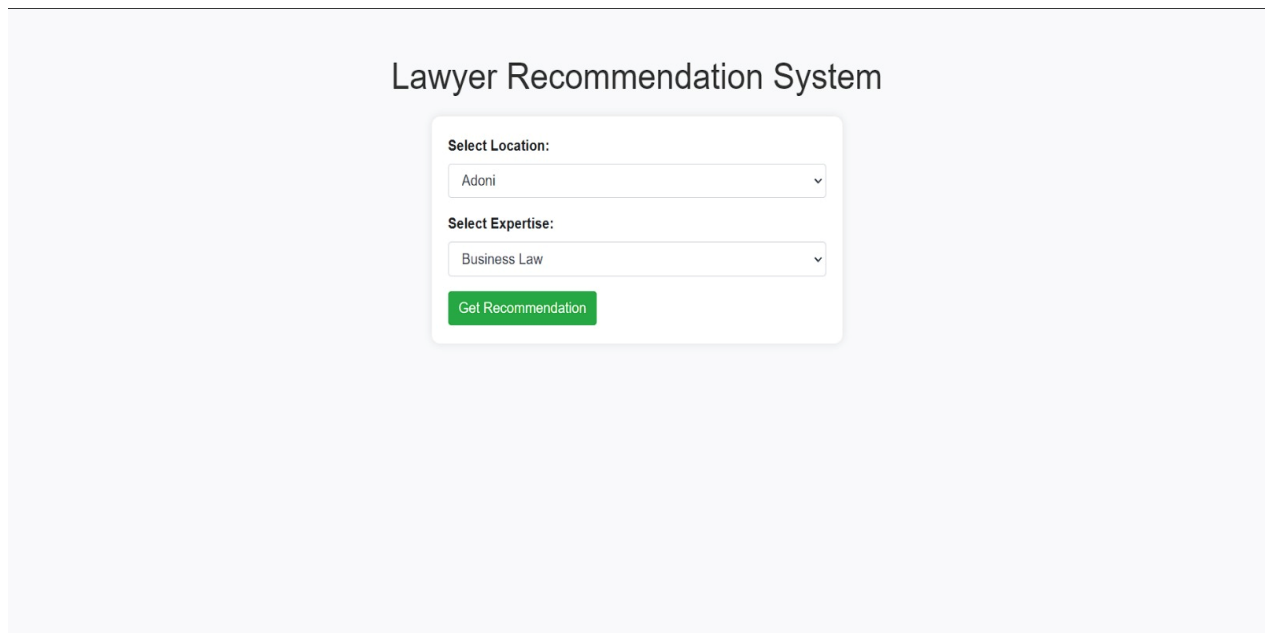
CHAPTER 6

RESULTS AND DISCUSSIONS

6.1 OUTPUT

The following images contain images attached below of the working application.

Example instance of generating a request and receiving the response:



The screenshot displays the 'Lawyer Recommendation System' interface. It features a light gray background with a central white form. The form contains two dropdown menus: 'Select Location:' with 'Adoni' selected, and 'Select Expertise:' with 'Business Law' selected. Below these is a green button labeled 'Get Recommendation'.

Fig 6.1(a) User Interface

Lawyer Recommendation System

Select Location:

Adoni ▼

Select Expertise:

Business Law ▼

- Business Law
- Criminal Defense Law
- Employment Law
- Environmental Law
- Family Law
- Immigration Law
- Intellectual Property Law
- Medical Malpractice Law
- Personal Injury Law
- Real Estate Law

Fig 6.1(b) Selection Phase

Recommended Lawyers				
Predicted Price(in ₹): 23956.24				
Lawyer Name	Location	Expertise	Fees in ₹	Rating (Out of 5)
Raghav Goswami	Adoni	Family Law	17872	3.7
Back to Home				

Fig 6.1(c) Response

Prediction:

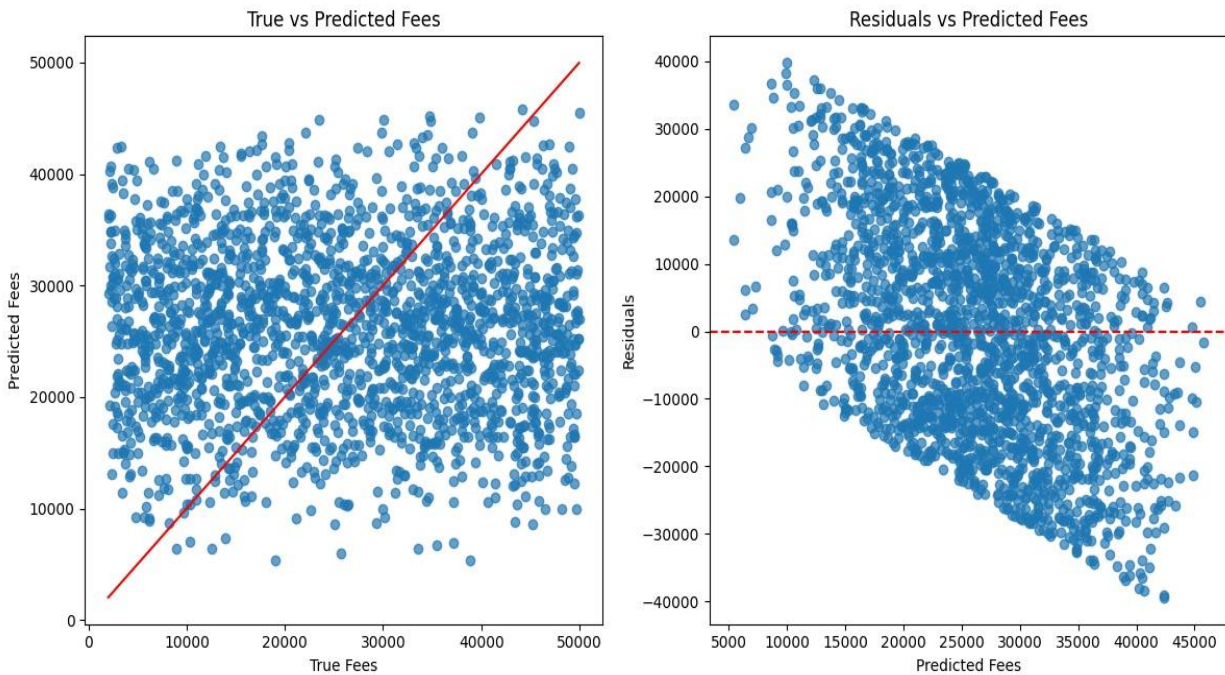


Figure 6.1(d) Correlation Graph

6.2 RESULT

The development of an AI-driven lawyer assignment system marks an intriguing exploration into the convergence of artificial intelligence and legal services. This project involved crafting a robust system within a Python environment, leveraging advanced machine learning techniques such as Natural Language Processing (NLP) and predictive modeling. Through extensive training and iterative improvements, the system learned to analyze legal queries, match them with suitable lawyers, and facilitate efficient lawyer-client assignments. The outcomes revealed a progressive enhancement in the system's accuracy and efficiency, transitioning from initial stages of basic matching to refined,

contextually aware recommendations over time. This endeavor not only showcased the system's adaptability and learning capabilities but also emphasized the significance of ongoing optimization to augment its performance. Despite encountered challenges, the project demonstrates the potential of AI in revolutionizing traditional legal practices, offering promising prospects for streamlining lawyer-client interactions and enhancing overall legal service delivery.

CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

7.1 CONCLUSION

In the culmination of this captivating journey into merging artificial intelligence with the domain of lawyer assignment, a compelling narrative of innovation and adaptability unfolds. The integration of advanced machine learning techniques, particularly the application of Natural Language Processing (NLP) and predictive modeling, has resulted in the development of an AI-driven system that surpasses conventional programmed responses. Through successive iterations, the system has evolved dynamically, showcasing its capacity to adapt and refine its strategies over time.

Observing the system's transformative journey from initial implementation to sophisticated decision-making processes underscores the significant impact of machine learning algorithms in reshaping the legal landscape. The iterative refinement of the system not only enhances its ability to match clients with suitable legal representation but also demonstrates its resilience and learning capabilities in navigating complex legal scenarios.

This exploration extends beyond the boundaries of traditional legal frameworks, providing valuable insights into the realm of autonomous decision-making and adaptive learning. Despite encountering challenges along the way, the gradual maturation of the AI-driven system serves as a testament to the remarkable potential of machine learning in revolutionizing the legal domain.

The evolving strategies and adaptability observed within the system highlight the versatility and efficacy of machine learning algorithms, suggesting promising

applications across various domains within the legal sphere.

7.2 FUTURE ENHANCEMENT

A potential future upgrade for the AI-driven lawyer assignment system might involve integrating more advanced machine learning methods or broadening its capabilities to offer additional features.

7.2.1 Personalized Legal Guidance System:

Develop an improved system that provides tailored legal recommendations based on user preferences, past interactions, and feedback. This could include:

Enhanced NLP Algorithms: Enhanced NLP Algorithms: Refining natural language processing algorithms to better understand complex legal queries and extract pertinent information accurately.

- 1. Personalized Suggestions:** Use machine learning to analyze user behavior and preferences, allowing the system to suggest lawyers that align closely with user needs.
- 2. Dynamic Feedback Loop:** Implement a feedback mechanism for users to rate and provide input on recommended lawyers, enabling continuous improvement of the recommendation algorithm.
- 3. Expansion of Legal Services:** Extend the system to offer a wider array of legal services beyond lawyer assignment, such as legal document creation, contract review, or legal advice forums.

By implementing these upgrades, the AI-driven lawyer assignment system can deliver a more customized and comprehensive legal assistance experience, catering effectively to diverse user requirements.

APPENDIX

SOURCE CODE:

```
from flask import Flask, request, render_template
import pandas as pd
from sklearn.preprocessing import LabelEncoder
import joblib

app = Flask(__name__)

# Load data and model
data = pd.read_csv('lawyer_recommendation_dataset.csv', encoding="ISO-8859-1")
model = joblib.load('lawyer_price_model.joblib')

# Encode categorical variables
label_encoder_location = LabelEncoder()
label_encoder_crime_branch = LabelEncoder()
data['location'] = label_encoder_location.fit_transform(data['Location'])
data['crime_branch'] = label_encoder_crime_branch.fit_transform(data['Expertise'])

# Get unique locations and expertise
unique_locations = sorted(data['Location'].unique())
unique_expertise = sorted(data['Expertise'].unique())

def predict_price(location, crime_branch):
    location_encoded = label_encoder_location.transform([location])[0]
    crime_branch_encoded =
    label_encoder_crime_branch.transform([crime_branch])[0]
```



```

        features = pd.DataFrame([[location_encoded, crime_branch_encoded]],
columns=['location', 'crime_branch'])

        predicted_price = model.predict(features)[0]
        return predicted_price

def recommend_lawyers(predicted_price, location, crime_branch, price_range=10000):
    min_price = predicted_price - price_range
    max_price = predicted_price + price_range
    recommended_lawyers = data[(data['Fees'] >= min_price) & (data['Fees'] <=
max_price) &
                                (data['Location'] == location) & (data['Expertise'] ==
crime_branch)]
    recommended_lawyers = recommended_lawyers.sort_values(by='Rating',
ascending=False)
    return recommended_lawyers[['Lawyer Name', 'Location', 'Expertise', 'Fees',
'Rating']]

@app.route('/')
def index():
    return render_template('index.html', locations=unique_locations,
expertise=unique_expertise)

@app.route('/result', methods=['POST'])
def result():
    location = request.form['location']
    crime_branch = request.form['crime_branch']
    predicted_price = predict_price(location, crime_branch)
    recommended_lawyers = recommend_lawyers(predicted_price, location,

```

```
crime_branch)
    return render_template('result.html', predicted_price=predicted_price,
lawyers=recommended_lawyers.to_dict('records'))

if __name__ == '__main__':
    app.run(debug=True)
```

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