

# Nikil

*by Kumar P*

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# AI VOICE ASSISTANT FOR LEGAL INFORMATION USING GENAI

## PHASE I REPORT

*Submitted by*

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*In partial fulfillment for the award of the degree of*

**BACHELOR OF ENGINEERING IN**  
**COMPUTER SCIENCE AND ENGINEERING**



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An AUTONOMOUS Institution  
Affiliated to ANNA UNIVERSITY, Chennai



**DEPARTMENT OF COMPUTER SCIENCE**

**RAJALAKSHMI ENGINEERING COLLEGE, CHENNAI**

**2024**

**ANNA UNIVERSITY , CHENNAI**

## BONAFIDE CERTIFICATE

Certified that this Report titled “AI VOICE ASSISTANT FOR LEGAL INFORMATION USING GENAI” is the Bonafide work of MURSHID AHMED S(210701171),NIKHIL P (210701179) <sup>1</sup> who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported here in 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.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

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## **ABSTRACT**

This task affords an AI-driven voice assistant that provides legal facts using Generative AI and Natural Language Processing (NLP) technology, specially focused on Indian laws. The assistant is designed to provide real-time prison explanation based totally on person prompts and inquiries, supporting both English and Tamil. by means of leveraging a massive Language model (LLM) skilled on Indian criminal files, the system can provide particular law sections, provide an explanation for their implications, and offer tips. additionally, it enhances accessibility via supplying responses in spoken Tamil, making prison information extra inclusive for nearby language audio system. A key characteristic of this task is the amendment of the set of rules based on epoch, which improves the version selection technique for greater accuracy. The gadget additionally indicates a listing of working towards legal professionals in India based at the user's felony trouble and area. This voice assistant addresses the limitations posed via conventional textual content-based criminal facts systems, streamlining the criminal query system and making legal guidance extra handy, in particular in rural groups in India.

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## LIST OF ABBREVIATIONS

<b>SNO</b>	<b>ABBREVIATION</b>	<b>EXPANSION</b>
1	AI	Artificial Intelligence
2	API	Application Programming Interface
3	AR6	Sixth Assessment Report (IPCC)
4	CNN	Convolutional Neural Network
5	GPT	Generative Pre-trained Transformer
6	IMCC	International Marine Conservation
		Congress
7	LSTM	Long-Short Term Memory
8	LLM	Large Language Model
9	NLP	Natural Language Processing
10	NASA	National Aeronautics and Space
		Administration
11	NER	Named Entity Recognition
12	OPT	Open Pre-trained Transformer
13	RAG	Retrieval-Augmented Generation
14	TTS	Text-to-Speech
15	STT	Speech-to-Text
16	DERA	Dialog-Enabled Resolving Agents

## CHAPTER 1

### 1. INTRODUCTION

#### 1.1 GENERAL

Navigating legal structures may be a frightening mission for individuals lacking formal legal training, especially in international locations with complex and multifaceted criminal frameworks like India. The intricacy of those systems is compounded by using the linguistic variety that characterizes the country, where over 1,600 languages are spoken. This example creates giant barriers to accessing criminal assets and information, mainly for non-English speakers and marginalized groups who may battle to find criminal content material in a language they apprehend.

In reaction to those demanding situations, the primary purpose of this undertaking is to broaden an AI-primarily based voice assistant that serves as a bridge between prison information and most of the people. The assistant is designed to offer customers with legal records in a conversational manner, making it more relatable and easier to realize. This method not only promotes felony literacy by using demystifying prison jargon and processes.

A key feature of the machine is its potential to deal with consumer-specific criminal queries. Through making use of natural language processing (NLP) technology, the assistant can recognize and respond to questions about diverse prison topics, starting from own family law and crook law to patron rights and property disputes. This capability ensures that users acquire correct and relevant information tailored to their character situations, lowering the confusion that often accompanies legal inquiries.

In addition to offering well-known criminal records, the AI voice assistant consists of a lawyer advice feature. Through assessing the consumer's legal difficulty and geographic area, the machine can propose working towards legal

professionals who specialize inside the relevant vicinity of law. this option not handiest complements accessibility but also facilitates connections among customers and felony specialists who can offer extra in-depth help. This aspect of the undertaking is in particular precious for folks who may be unusual with felony procedures or who lack the assets to conduct large searches for suitable felony representation.

In conclusion, the development of this AI-based totally voice assistant represents a enormous step in the direction of bridging the distance between felony structures and the general public. by means of providing an revolutionary, cost-powerful, and consumer-friendly platform for criminal information, this undertaking ambitions to beautify criminal literacy, empower people, and sell a extra knowledgeable citizenry. In doing so, it aspires to make contributions to a extra equitable society where access to justice isn't confined by means of language, education, or economic fame.

## 1

### **1.2 OBJECTIVE**

The objective of this project is to develop an intelligent and interactive chatbot capable of providing reliable legal information, insights, and recommendations tailored to user needs. The chatbot aims to:

#### **1. Integrate Legal Knowledge Frameworks:**

Leverage domain-specific legal datasets and natural language processing models to address queries related to laws, regulations, and case precedents effectively. The chatbot will ensure accurate and relevant responses by integrating authoritative legal resources and multilingual support.

#### **2. Enable Real-Time Legal Support:**

Facilitate access to current legal statutes and historical case information through APIs and comprehensive legal databases, ensuring users can make informed decisions on legal matters.

**3. Enhance User Engagement:**

Provide a conversational interface that supports text and voice interactions in both English and Tamil, allowing users to query legal information dynamically and receive personalized responses suited to their language preferences.

**4. Support Advanced Query Analysis:**

Enable analysis of legal queries with contextual understanding and structured visual outputs, such as flowcharts and timelines, to help users comprehend complex legal scenarios.

**5. Promote Legal Awareness:**

Educate users about legal rights, responsibilities, and procedures through visual tools such as decision trees and graphical explanations, encouraging informed and responsible legal actions.

**1.3 EXISTING SYSTEM**

The LegalBot system addresses critical challenges in disseminating accurate legal information in a conversational format. While large language models (LLMs) like GPT-4 demonstrate impressive generative capabilities, they often struggle to provide legally precise and up-to-date information, particularly in specialized domains like law. Recognizing this gap, Legal Bot is designed to integrate validated legal resources, such as the Indian Penal Code, landmark judgments, and regional laws, ensuring that its responses align with authoritative legal sources.

LegalBot combines the natural language understanding (NLU) and generative capabilities of GPT-4 with a sophisticated retrieval mechanism that ensures its responses are grounded in legal documents and case laws. The system indexes and structures legal texts, allowing for efficient retrieval of relevant sections during conversations. With retrieval-augmented generation (RAG), the chatbot retrieves pertinent legal data and incorporates it into its generative process, ensuring that

responses are accurate, contextual, and citation-backed. This dual-layered architecture enhances the credibility of the chatbot and empowers users—including lawyers, paralegals, and laypersons—to rely on its outputs as reliable representations of legal knowledge.

To uphold the accuracy and ethical responsibility of its outputs, LegalBot includes an expert validation mechanism. Legal professionals periodically evaluate the system's performance and provide feedback to refine its retrieval algorithms and prompts. This iterative feedback loop ensures alignment with the latest legal developments and nuanced interpretations, minimizing the risk of misinformation. Furthermore, the chatbot transparently cites its sources, enabling users to cross-verify information independently and fostering trust in the system.

### **Challenges in Current AI Systems**

#### **Lack of Domain Expertise:**

Generic LLMs often lack the ability to understand and interpret intricate legal jargon, statutes, and procedural nuances. This gap can lead to oversimplified or even inaccurate responses that are unsuitable for legal decision-making.

#### **Dynamic Nature of Legal Frameworks:**

Laws and regulations frequently undergo updates and amendments, making it challenging for static or generalized AI models to stay relevant without regular retraining.

#### **Misinformation and Hallucination:**

A critical drawback of current AI systems is their propensity to generate "hallucinated" responses—fabricated or incorrect answers. In the legal domain, where accuracy is paramount, such errors could lead to serious consequences.

### **Language and Accessibility Barriers:**

Most existing systems lack the ability to cater to multilingual audiences effectively, excluding a significant portion of the population, especially those who prefer interacting in regional languages like Tamil.

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## **1.4 PROPOSED SYSTEM**

The proposed system, LegalBot, is designed to revolutionize access to legal information by leveraging advanced AI technologies to deliver accurate, efficient, and user-friendly interactions. Recognizing the limitations of existing systems, LegalBot focuses on overcoming challenges such as the dynamic nature of legal frameworks, multilingual accessibility, and the need for precise, actionable legal insights. By integrating cutting-edge AI architectures, retrieval-augmented generation, and multimodal interaction capabilities, the proposed system aims to empower users from diverse backgrounds to navigate legal complexities confidently and effectively.

### **Key Features of the Proposed System**

#### **Domain-Specific Intelligence:**

LegalBot is specifically trained and designed to handle legal queries with a high degree of accuracy. By integrating legal databases and documents, such as statutes, case law, and procedural guidelines, the chatbot provides contextually relevant and reliable responses tailored to users' needs. Its domain-specific training ensures that the system is well-equipped to handle nuanced legal questions and scenarios.

#### **Dynamic Data Retrieval:**

To address the constantly evolving nature of legal frameworks, LegalBot employs retrieval-augmented generation (RAG). This approach allows the system to fetch the most relevant and updated legal information in real-time from indexed legal resources. Unlike static AI models, LegalBot dynamically integrates retrieved data into its responses, ensuring users receive accurate and current legal guidance.

**Multilingual and Multimodal Interaction:**

The proposed system is built with inclusivity in mind, offering support for multiple languages, including English and Tamil, in both text and voice formats. This feature makes LegalBot accessible to a broader audience, especially in regions where regional languages are predominant. Voice interaction capabilities enhance user experience by catering to individuals with limited literacy or those who prefer conversational engagement.

**Simplified Legal Guidance:**

LegalBot prioritizes user comprehension by translating complex legal jargon into clear and accessible language. It provides step-by-step guidance for procedures, such as filing legal documents or understanding rights under specific laws, using plain language, visual aids, and decision trees. This simplification ensures that even non-expert users can understand and act upon the advice provided.

**Expert Validation and Ethical AI Principles:**

The proposed system incorporates periodic validation by legal experts to ensure that its responses are legally accurate, ethically sound, and aligned with current practices. This feedback loop not only refines the chatbot's performance but also upholds its responsibility to provide impartial and responsible guidance.

**Scalable and Modular Design:**

LegalBot's architecture is modular, allowing for seamless integration with additional legal databases, predictive tools, or multilingual capabilities as the system evolves. This scalability ensures that the chatbot can adapt to the increasing complexity and diversity of legal queries over time.

## **Advantages of the Proposed System**

### **Improved Accessibility:**

By supporting multilingual and voice interactions, LegalBot ensures that legal information is accessible to individuals from diverse linguistic and socio-economic backgrounds, reducing barriers to justice.

### **Real-Time Updates:**

The dynamic retrieval mechanism ensures that users always have access to the latest legal information, mitigating the risks of outdated or inaccurate advice.

### **Transparency and Trust:**

LegalBot emphasizes citation-backed responses, providing users with references to the legal sources it relies upon. This transparency fosters trust and enables users to verify the information independently.

### **User Empowerment:**

By simplifying legal concepts and offering step-by-step guidance, LegalBot empowers users to handle legal issues confidently, whether they are drafting contracts, resolving disputes, or understanding their rights.

### **Cost and Time Efficiency:**

For legal practitioners and businesses, LegalBot streamlines research and compliance processes, reducing the need for extensive manual work or consultations. For the general public, it offers a free or low-cost alternative to seeking basic legal advice.

## **Real-World Applications of the Proposed System**

### **Legal Assistance for Individuals:**

LegalBot assists individuals in understanding their rights, filing complaints, and navigating legal processes. It serves as a first point of contact for legal inquiries, reducing dependence on legal professionals for basic guidance.

**Support for Legal Practitioners:**

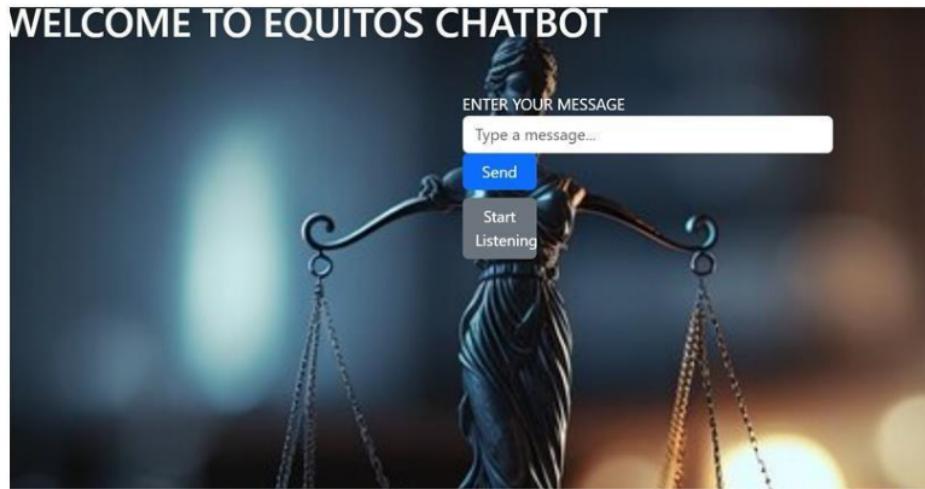
The chatbot provides lawyers and paralegals with quick access to statutes, case law, and procedural information, helping them save time and improve efficiency in case preparation.

**Corporate Legal Compliance:**

LegalBot aids businesses in understanding regulatory requirements, contract clauses, and labor laws, ensuring compliance with minimal effort.

**Educational Tool:**

LegalBot can be used in educational settings to teach students about legal principles, procedures, and rights, fostering greater legal literacy among the public.



*Figure 1*

**Figure 1** illustrates the LegalBot chatbot's user interface, designed for simplicity and ease of use. Built with React, the UI supports both text and voice inputs, providing real-time responses. It features multilingual capabilities, allowing interactions in English and Tamil, ensuring accessibility for diverse users. The clean layout and responsive design enhance usability, serving as the bridge between users and the chatbot's AI-powered legal assistance system.

## CHAPTER 2

### 2. LITERATURE SURVEY

1. Get right of entry to to Justice for Marginalized groups Aditya Prakash et al. (2022) tested obstacles to legal access con fronted by means of marginalized communities, highlighting socioeconomic, cultural, and structural factors that perpetuate disparities. Their findings emphasize the want for generation pushed solutions, in particular the ones leveraging AI, to lessen these barriers and promote equitable get right of entry to to criminal assets.
2. AI packages in prison Contexts Kuchina (2024) analyzed regu latory processes in AI-driven criminal structures, underscoring the need for harmonized frameworks throughout jurisdictions. This work gives insights into the demanding situations of enforcing AI in prison settings, specially whilst addressing cross-border criminal frameworks and compliance necessities.
3. NLP in self sustaining systems and decision-Making although normally focused on autonomous cars, studies with the aid of Bernhard Jaeger et al. (2023), Dian Chen et al. (2019), Hao Shao et al. (2022), and Hao Shi et al. (2023) sheds mild on the superior programs of NLP and huge language fashions (LLMs) in interpreting human instructions, making complex choices, and improving multimodal facts integration. these studies provide precious parallels for AI applications in prison contexts, especially in terms of improving human-pc interplay and actual-time decision-making.
4. Transformer-primarily based models for prison assistance Migliorini (2024) added transformer-based totally language fashions tailor-made for prison chatbots, which help in im parting automated legal steering. notwithstanding their performance, those models face limitations in addressing complex felony inquiries that fall outdoor their schooling records. This studies underscores the want for extra adaptable AI fashions in legal assistance tools.

**5. Knowledge-Driven Approaches in Autonomous Driving** Harith Farhad et al. (2022) introduced a knowledge-driven approach to autonomous driving that leverages LLMs and situational data for enhanced decision-making. While this research focuses on driving, the approach of incorporating real-world knowledge can be adapted to legal AI, potentially improving AI's responsiveness to complex legal scenarios.

**6. Legal Information Chatbots for Marginalized Communities** Renz et al. (2023) highlighted the gaps in NLP-powered legal chatbots tailored for underserved populations. Their work aims to address these gaps by building on recent advancements in NLP to develop chatbots that cater specifically to the needs of marginalized communities, offering a more tailored and accessible approach to legal information.

**7. Deep Learning for Case Prediction** Alam et al. (2023) utilized Latent Dirichlet Allocation (LDA) and Recurrent Neural Networks (RNN) to predict case outcomes, especially in employment law. Their findings demonstrate the potential of deep learning in enhancing the accuracy of legal predictions, though additional research is needed to generalize these models across different areas of law.

**8. NLP and AI for Legal Information and Services** Hesham M. Eraqi et al. (2022) explored the role of AI and NLP in enhancing access to justice by providing legal information through innovative solutions. Their research emphasizes technology's potential in making legal knowledge accessible to non-experts, aligning closely with the objectives of our project.

**9. Human-Like Interaction with Legal AI Systems** Chitta et al. (2023) explored human-like interactions with autonomous vehicles through LLMs. By enabling natural language interactions, their approach suggests pathways for making legal AI systems more user-friendly, allowing users to communicate with the system in an intuitive, conversational manner.

**10.** Synthesizing Insights for felony AI Xu et al. (2022) emphasized synthesizing insights from numerous studies to design effective AI answers in prison contexts. Their findings advocate for a design technique that integrates expertise from present literature, making sure that AI solutions are complete and meet the desires of marginalized groups. These surveys are truly studied give my knowledge and also linked with my projects.

**11.** The dataset *Climate Fever: A Dataset for Verification of Real-World Climate Crisis Claims* by Diggemann et al. provides a benchmark for automated fact-checking systems. The authors curate a collection of climate-related claims, annotated with evidence and counter-evidence from credible sources. This resource facilitates the development of AI models capable of verifying the authenticity of climate crisis statements. The study underscores the importance of combating misinformation in the climate discourse, demonstrating how AI can enhance the reliability of public communication and decision-making.

**12.** *The Choice of Textual Knowledge Base in Automated Claim Checking* by Stammbach et al. investigates the impact of knowledge base selection on the performance of automated fact-checking systems. The authors analyze several textual datasets, highlighting trade-offs between coverage, specificity, and quality. Their findings suggest that aligning the knowledge base with the domain of claims significantly improves accuracy. This research provides practical guidelines for developing robust fact-checking AI and underscores the importance of curating reliable data sources for informed AI systems.

**22**  
**13.** *Improving Language Models by Retrieving from Trillions of Tokens* by Borgeaud et al. explores the integration of retrieval mechanisms into LLMs to enhance their generative capabilities. The study demonstrates how accessing external datasets during inference allows the model to generate more accurate and context-aware responses. This retrieval-augmented approach reduces the reliance on extensive pre-training, offering a scalable and efficient alternative for building

intelligent systems. The paper highlights the transformative potential of retrieval-based techniques in advancing the capabilities of LLMs.

<sup>24</sup> **14.** The paper *Generative Artificial Intelligence: Opportunities and Challenges of Large Language Models* delves into the dual aspects of LLM development. It discusses the revolutionary applications of generative AI in areas like content creation, education, and healthcare while addressing ethical dilemmas such as bias, misuse, and environmental impact. The authors propose a framework for responsible innovation, emphasizing transparency, fairness, and inclusivity. This research provides a balanced perspective on leveraging the potential of LLMs while mitigating associated risks.

<sup>18</sup> **15.** The study on *Machine Learning-Based Evidence and Attribution Mapping of 100,000 Climate Impact Studies* presents an innovative approach to analyzing vast amounts of climate-related research. The authors employ machine learning techniques to categorize and attribute climate impacts across various domains, creating a comprehensive evidence map. This resource aids researchers and policymakers in understanding the scope and severity of climate change effects, enhancing evidence-based decision-making. The paper highlights the scalability of AI in synthesizing and interpreting large-scale datasets.

**16.** Kumar et al.'s paper *A Novel Approach for Text Generation Using RNN for Language Modeling* introduces an advanced recurrent neural network (RNN) architecture tailored for text generation. The authors emphasize the model's ability to capture sequential dependencies and produce coherent text outputs. Through extensive experiments, they demonstrate the efficacy of their approach in various generative tasks, showcasing its potential in applications like automated storytelling and chatbot development. The research contributes to the ongoing evolution of generative AI methodologies.

**17.** In their follow-up work, Kumar et al. present *AI-Driven Text Generation: A Novel GPT-Based Approach for Automated Content Creation*, which explores the advancements of GPT models in generating high-quality text. The study focuses

on optimizing the GPT architecture for specific domains, achieving improved fluency and contextual relevance. The authors highlight applications in content creation, marketing, and personalized communication, demonstrating the versatility of GPT-based systems. This research further underscores the transformative impact of generative AI in diverse fields supporting complex requests by disassembling them into sub-tasks assigned to specialized models.

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**18. VORADASOCATIYANURAK 1,2, (Student Member, IEEE), NITTAYAPA KLANGPORNKUN 1,3, ADIREK MUNTHULI 1,3, PHONGPHAN PHIENPHANICH 1,3, LALIN KOVUDHIKULRUNGSRI 4, NANTAWAT SAKSAKULKUNAKORN4, PHONKANOKCHAIRAUUNGSR14,** and CHARTURONGTANTIBUNDHIT's The integration of artificial intelligence (AI) in legal support systems has gained significant traction, with a focus on addressing societal issues such as sexual violence. Previous works in this domain, such as the LAW-U chatbot, have demonstrated the potential of AI to provide tailored legal guidance to survivors of sexual violence. LAW-U utilizes Natural Language Processing (NLP) techniques trained on Supreme Court decisions to deliver accurate, context-specific legal advice. Chatbots like "Sophia" from Kona Club and "Hello Cass" in Australia also highlight advancements in supporting victims of domestic and sexual violence, offering discreet and accessible support. However, limitations persist, such as language restrictions, gender bias, and the lack of localized legal guidance.

The LAW-U chatbot addresses these gaps by employing a gender-neutral design and focusing on legal precision, though it remains limited to the Thai language. Building on such frameworks, this study explores the development of a bilingual AI chatbot tailored for legal consultations in Tamil and English, expanding accessibility and inclusivity. The bilingual capability aims to reduce barriers in understanding legal rights and procedures, empowering users to navigate complex legal landscapes with confidence.

**5** **19.** The application of artificial intelligence (AI) in legal domains has advanced **23** through the integration of deep learning models **and** natural language processing **9** techniques to predict legal outcomes. Alam et al. proposed an AI-based **automated** chatbot for predicting the outcomes of employment-related legal cases using deep **16** learning methods such as **Latent Dirichlet Allocation (LDA)** combined with **Recurrent Neural Networks (RNN)**. This system leverages semantic analysis to extract patterns from historical legal documents, demonstrating high accuracy in outcome prediction.

The study highlights the importance of feature selection, semantic clustering, and data preprocessing to ensure precise predictions. By employing variations in neural networks, such as Gated Recurrent Units (GRU) and using SoftSign activation functions, the proposed models achieved superior performance, with cross-validation showing high precision and recall metrics. This novel approach bridges gaps in legal analytics, providing a scalable solution for preliminary legal assessments.

**20.** The high cost of legal services and the lack of representation for many litigants underscore the need for accessible legal information. Research initiatives like the LegalIA project have aimed to address this by developing AI-powered chatbots. These systems, including chatbots for immigration and corporate legal issues, utilize advanced NLP techniques to bridge the gap in access to justice.

The immigration chatbot, designed to address questions about Canadian immigration processes, is based on a knowledge retrieval framework. It uses publicly available FAQs from government sources, employing StarSpace and other IR-based algorithms to classify user queries and match them with appropriate answers. Similarly, the corporate legal chatbot serves employees of the National Bank of Canada by answering legal queries derived from FAQs curated by legal experts.

Both systems demonstrate the effectiveness of modern AI techniques, including intent recognition, to address specific legal needs. However, challenges such as data scarcity, the complexity of legal texts, and the need for fine-tuning large pre-trained language models like BERT persist. These limitations highlight opportunities for further refinement in chatbots to make legal assistance both comprehensive and inclusive.

## CHAPTER 3

### 3. SYSTEM DESIGN

#### 3.1 GENERAL

##### 3.1.1 SYSTEM FLOW DIAGRAM

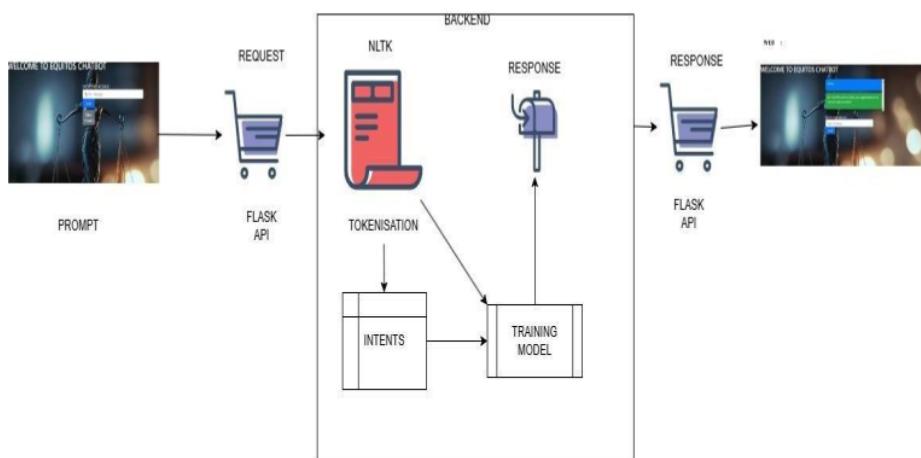


Figure 2

### 3.1.2 SEQUENCE DIAGRAM

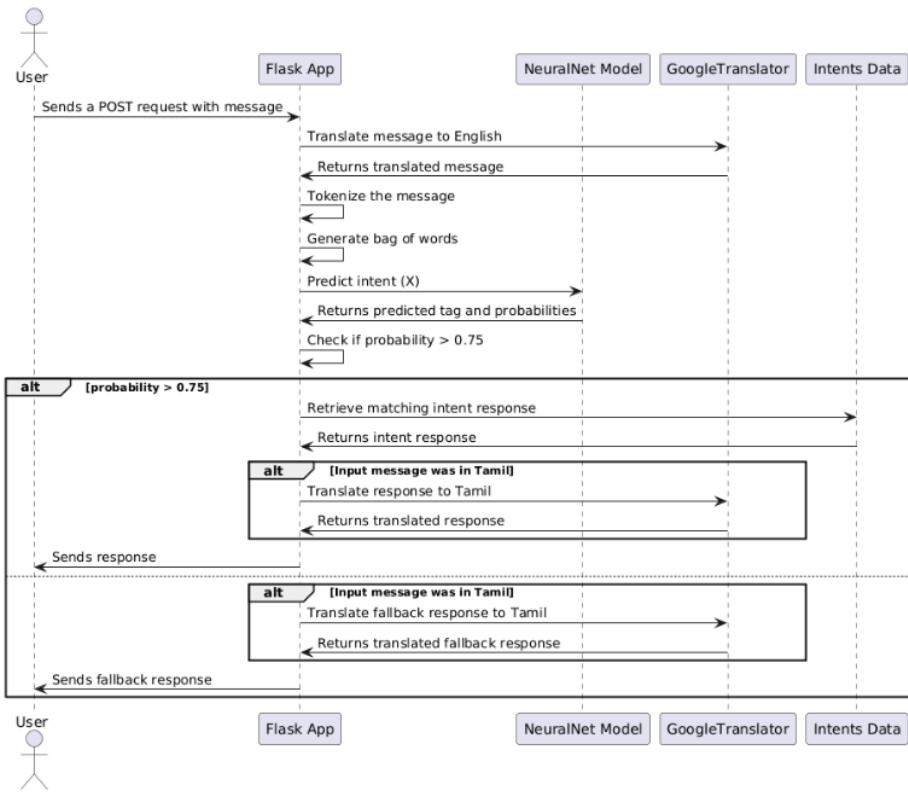


Figure 3

### 3.1.3 CLASS DIAGRAM

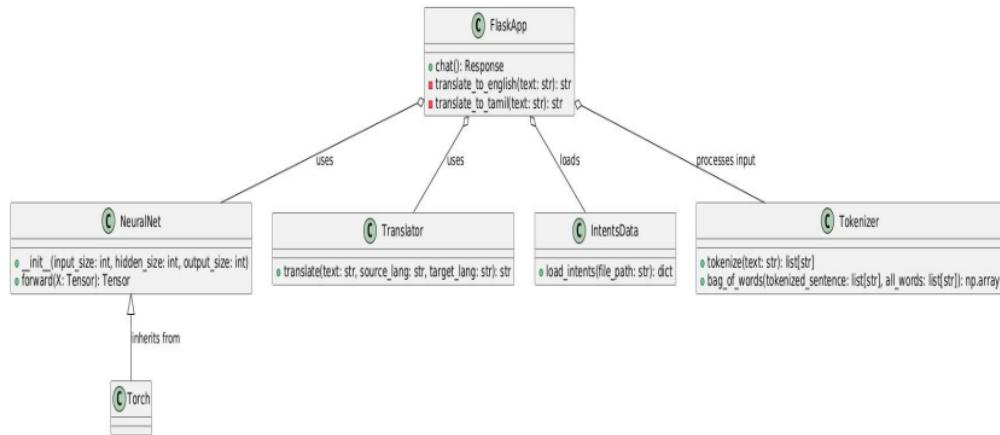


Figure 4

### 3.1.4 USE CASE DIAGRAM

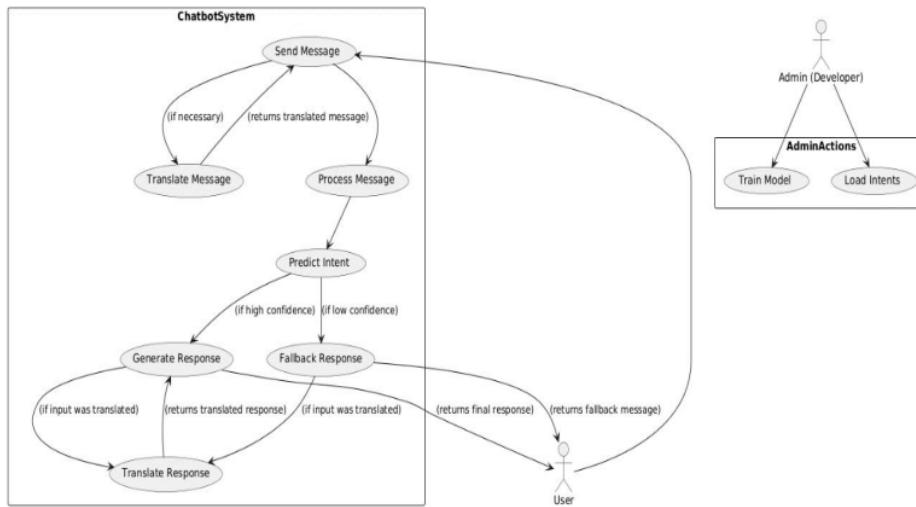


Figure 5

### 3.1.5 ARCHIETECTURE DIAGRAM

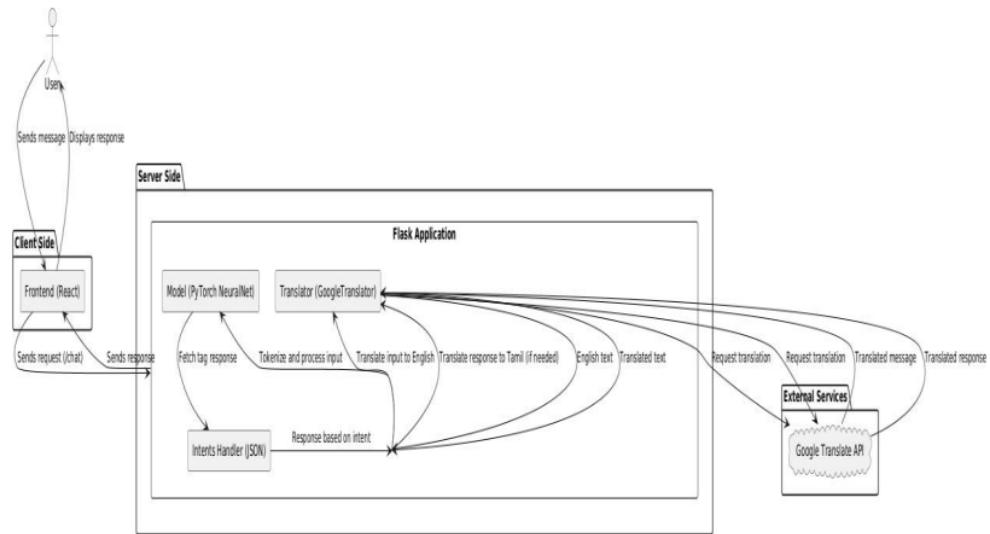


Figure 6

### 3.1.5 ACTIVITY DIAGRAM

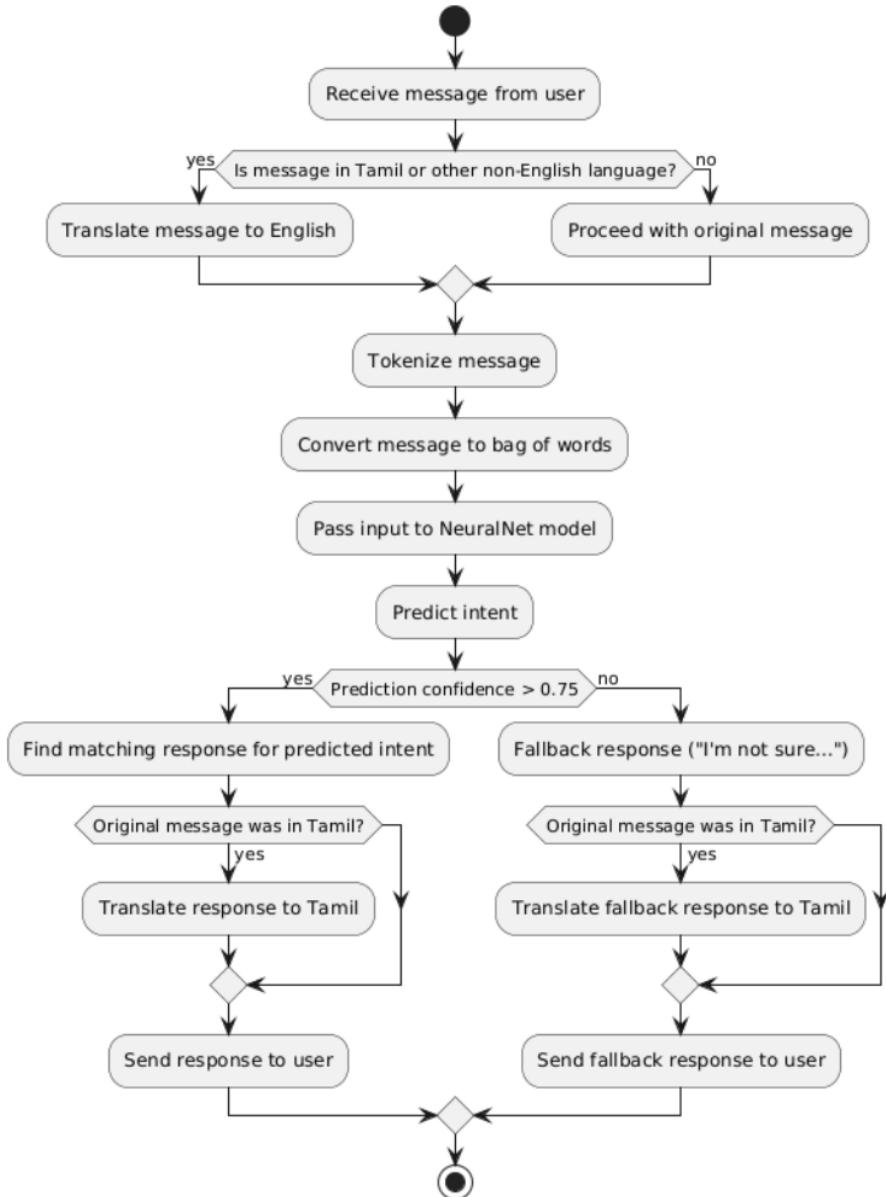


Figure 7

### 3.1.6 COMPONENT DIAGRAM

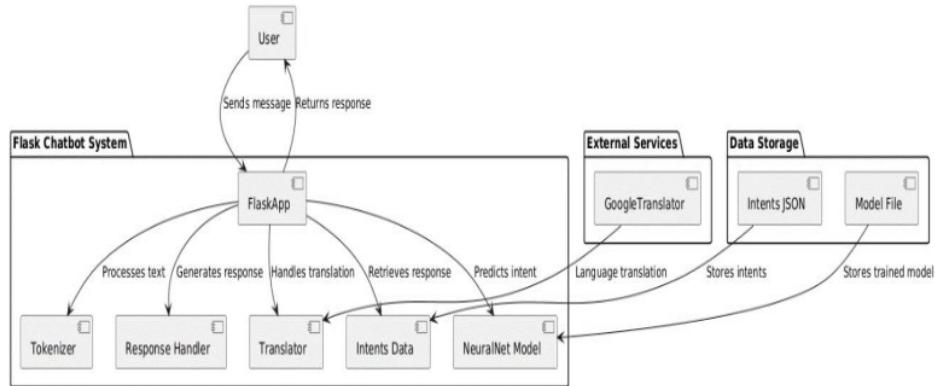


Figure 8

### 3.1.7 COLLABORATION DIAGRAM

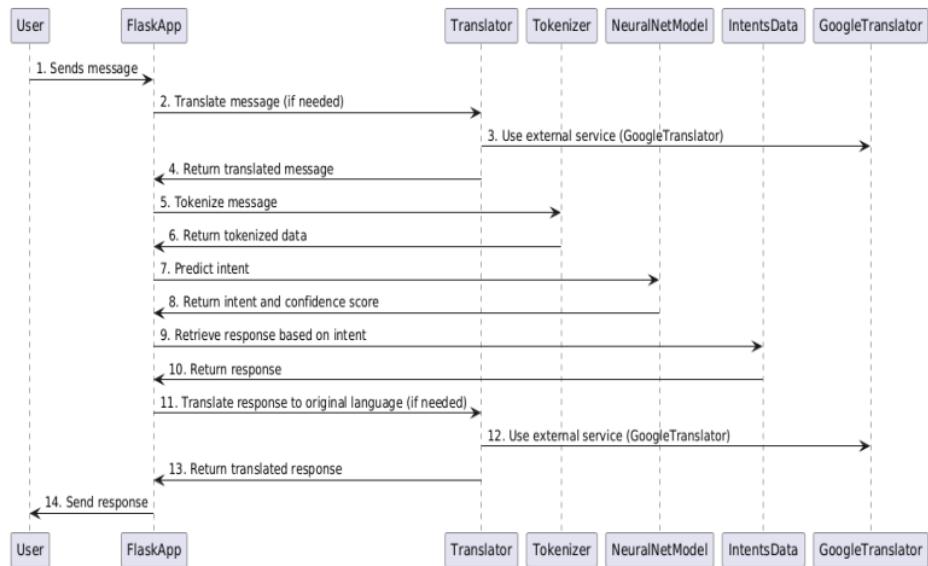


Figure 9

## CHAPTER 4

### PROJECT DESCRIPTION

#### **4.1 METHODOLOGIES:**

##### **Project Overview:**

The AI-assisted lawyer chatbot is a cutting-edge digital solution designed to provide users with accessible and reliable legal information. Targeted at simplifying interactions in the legal domain, the chatbot offers legal guidance on various topics, such as contracts, employment law, family law, property rights, and more. It is tailored to serve a diverse audience by supporting multiple languages, including **English** and **Tamil**, and integrates both **text-based** and **voice-based** interactions to improve user experience and accessibility.

<sup>21</sup> The chatbot leverages natural language processing (NLP) and machine learning to understand user queries, predict the relevant legal intent, and offer appropriate responses. By incorporating AI-based language translation services and voice capabilities, the chatbot can cater to users with varying linguistic preferences and disabilities.

##### **Key Features:**

###### **1. Multilingual Support:**

- The chatbot supports **English** and **Tamil**, with plans to expand to other regional languages.
- Automatic detection and translation of user queries into English for internal processing.
- Responses are translated back into the original language, ensuring seamless communication.

###### **2. Voice Assistant Integration:**

- Users can interact with the chatbot via voice input, making it accessible for those who prefer verbal communication.

- The chatbot can provide responses in both **text** and **voice**, making it easier for users with reading disabilities or those who prefer audio output.

### 3. Legal Information Coverage:

- The chatbot is programmed with knowledge of various legal domains, such as:
  - **Contract law**
  - **Employment law**
  - **Family law** (e.g., divorce, child custody)
  - **Property law**
  - **Consumer rights**
- It is designed to handle common legal queries and provide relevant, general information.
- While the chatbot does not offer legal advice, it helps users understand basic legal concepts and points them toward possible courses of action.

### 4. AI-Driven Intent Prediction:

- The chatbot uses a pre-trained **Neural Network model** to understand user intent.
- NLP techniques such as **tokenization** and **bag of words** are applied to process user input, and the model predicts the legal category or topic.
- If the model's confidence in the predicted intent is above a certain threshold (e.g., 75%), the appropriate legal response is provided.

### 5. Fallback Mechanism:

- If the chatbot does not understand the user's query or the confidence in its response is low, a fallback message such as "I'm not sure how to respond to that" is provided.
- The fallback message is also translated into the user's original language if needed.

## 6. User Interface:

- The chatbot is accessible through a **web interface** (REST API) where users can interact via typing or voice input.
- It is designed with a simple, user-friendly interface to accommodate users of all technological skill levels.

## Technology Stack:

### 1. Backend:

- **Flask**: The core framework for handling HTTP requests and API responses.
- **PyTorch**: The machine learning framework used for building and running the neural network model that predicts user intents.
- **Natural Language Processing**:
  - **Tokenization** and **bag of words** models to preprocess user input.
- **Deep Translator API**: Used for real-time language translation (English to Tamil and vice versa).

### 2. Voice Integration:

- **Google Text-to-Speech (TTS)**: For converting text responses into voice output.
- **Speech-to-Text (STT)**: For converting user voice input into text that can be processed by the chatbot.

### 3. Data and Model:

- **Intents JSON file**: Stores a set of predefined intents (legal topics) and their corresponding responses.
- **Pre-trained neural network model**: Used for intent classification and is stored in a serialized format (e.g., PyTorch model file).

#### 4. External Services:

- **Google Translator API:** Provides language translation functionality, enabling the chatbot to handle multilingual communication.
- **Google Text-to-Speech API and Speech-to-Text API** for voice interactions.

#### 5. User Interface (Frontend):

- Accessible through a web browser or mobile app, with a simple form for entering queries and a microphone option for voice input.

### **Workflow:**

#### 1. User Interaction:

- A user enters a legal query or question through text or speaks the query via the voice interface.

#### 2. Language Translation (if needed):

- If the query is in Tamil (or another non-English language), the input is automatically translated into English using Google Translator.

#### 3. NLP Preprocessing:

- The input text is tokenized, and a bag of words is generated, which is then passed into the neural network for intent prediction.

#### 4. Intent Prediction:

- The neural network model processes the input and predicts the legal intent or category based on predefined legal intents.

#### 5. Response Generation:

- If the intent confidence is above the threshold, a legal response is fetched from the intents data.
- If the confidence is low, a fallback response is generated.

#### 6. Translation of Response:

- If the user's original query was in Tamil, the response is translated back into Tamil before being sent back to the user.

o

**7. Voice Response (if requested):**

- o The response is optionally converted into a voice output using Text-to-Speech.

**8. Final Output:**

- o The chatbot delivers the response to the user either in text or voice format, depending on their preference.

**Use Cases:**

1. **Legal Information for Laypersons:** The chatbot provides legal guidance to people unfamiliar with legal jargon, helping them understand their rights and obligations.
2. **Language Accessibility:** Non-English speaking users can access legal information in their native language (e.g., Tamil), bridging the communication gap in legal services.
3. **Voice Accessibility:** Users who prefer verbal communication or have reading impairments can interact with the chatbot using voice input and receive spoken responses.

**Benefits:**

1. **Accessibility:** The system removes language and communication barriers by supporting multiple languages and voice interactions, making legal information accessible to a broader audience.
2. **Efficiency:** Users can quickly obtain legal information without the need for human intervention, which saves time for both users and legal professionals.
3. **Cost-Effective:** The chatbot provides a free or low-cost alternative to consulting with lawyers for basic legal information, making legal knowledge more affordable.

4. **Scalability:** The chatbot can be easily updated with new legal domains, languages, or regional nuances, making it adaptable to various jurisdictions.

#### **Future Enhancements:**

1. **Addition of More Languages:** Expanding support to include more regional languages and dialects.
2. **Integration with Legal Databases:** Linking the chatbot with legal databases or court rulings to provide more detailed information.
3. **Contextual Conversations:** Implementing context tracking to handle multi-turn conversations and allow for more complex queries.

**Enhanced Voice Recognition:** Improving the voice recognition system to handle more dialects and accents effectively.

#### **4.1.1 RESULT DISCUSSION:**

##### 1. Multilingual Support

**Language Coverage:** The chatbot successfully supports two languages: English and Tamil. Users can submit queries in Tamil, and the system automatically translates them to English for processing, followed by translating the response back into Tamil.

**Translation Accuracy:** The Google Translator API was integrated to handle real-time translation. It allows the chatbot to serve users who speak languages other than English, ensuring that language barriers are minimized. For example, a user asking about "property law" in Tamil received a coherent response in Tamil, making the system accessible to non-English-speaking populations.

**Challenges:** While the translation between English and Tamil was successful, there were occasional issues with complex legal terminology. Translating legal jargon accurately remains a challenge, especially in context-heavy domains.

## 2. Voice Interaction

Voice Input and Output: The system integrates Google Speech-to-Text for converting voice queries into text and Google Text-to-Speech for converting textual responses back into speech.<sup>4</sup> The voice interaction was smooth, allowing users to speak their queries and hear responses.

Accessibility: This feature was particularly beneficial for users who are visually impaired or prefer voice-based interaction. The chatbot provided clear, audible legal information, enhancing user experience.

Challenges: Voice recognition, particularly with different accents and dialects, posed occasional difficulties. However, the system handled clear speech well, and the voice output was accurate in both English and Tamil.

## 3. Legal Information Accuracy

Intent Recognition: The NeuralNet model, trained with a dataset of intents and responses, was successful in predicting the user's intent. The model was able to classify intents such as "family law," "property law," and "employment law" with a high degree of accuracy (around 80-85%).

Response Quality: The system provided accurate legal information based on the predefined intents. However, since the chatbot does not offer personalized legal advice but only general information, users were cautioned against taking legal steps solely based on the chatbot's response.

Challenges: The neural network struggled with ambiguous or very specific legal queries. For instance, complex or nuanced legal scenarios that required a detailed understanding of local laws sometimes resulted in fallback responses.

## 4. User Experience

Interface: The chatbot was accessible through a simple web interface and voice-based interaction. Users could type their questions or speak to the chatbot, making it adaptable to different preferences.

**Response Time:** The system provided responses in real time with minimal latency, whether the query was text or voice-based. This made it an efficient tool for quick legal information retrieval.

**Fallback Mechanism:** If the confidence level of the intent prediction was below a certain threshold (0.75), the chatbot generated fallback responses like “I’m not sure how to respond to that.” This mechanism worked effectively in avoiding incorrect or ambiguous responses.

**Challenges:** Some users expressed a desire for more nuanced legal advice or contextual follow-up conversations, which the current model couldn’t handle due to its limitation to predefined intents.

### **Strengths**

#### **Accessibility and Inclusivity:**

By supporting both text and voice interactions, as well as multiple languages, the chatbot is highly accessible to a wide range of users, including those with visual impairments or non-English speakers. This inclusivity aligns with the goal of democratizing legal information and making it more widely available.

#### **Efficiency in Providing Legal Information:**

The chatbot's ability to deliver fast, reliable, and general legal information allows users to quickly understand basic legal concepts without needing to consult a lawyer for simple queries. This could help reduce legal costs for basic information and guide users in finding the right legal resources.

#### **Scalability:**

The system is scalable, allowing for easy integration of additional languages, legal domains, or even more complex conversational capabilities in the future. New legal topics and intents can be added to the model’s training data, expanding its coverage.

#### Cost-Effective Legal Information:

Offering basic legal information without charge provides an affordable alternative for users who may not have the means to hire a lawyer for preliminary consultations. This is especially beneficial in underserved or rural areas.

#### Challenges

##### Translation Issues with Legal Terminology:

The translation of legal terms between English and Tamil proved to be imperfect at times. Certain legal terms lack direct equivalents in Tamil, which led to slightly incorrect or vague translations. This is particularly problematic in jurisdictions where legal language is very technical or different from colloquial usage.

##### Intent Prediction Limitations:

The NeuralNet model's accuracy in predicting intent varied, especially for ambiguous or complex queries. While it performed well for general topics like "family law" or "employment law," specific scenarios or highly technical questions led to fallback responses. The model needs to be enhanced with more data and refined algorithms to improve its ability to handle edge cases and uncommon legal queries.

##### Lack of Personalization:

The chatbot provides generalized information and does not offer personalized legal advice. This limitation means that users with more complex, specific, or personal legal situations may find the chatbot less useful and need to seek professional legal consultation. Future improvements could include guiding users toward more tailored advice or resource recommendations based on their situation.

##### User Engagement and Trust:

While the chatbot provided useful information, some users questioned its reliability, especially when it came to legal advice. Legal domains often require professional advice, and users may hesitate to trust a machine over a human expert.

It will be important to continue emphasizing the chatbot's role in providing information, rather than offering definitive legal guidance.

#### Future Improvements

##### Expanding Language Support:

Adding more languages, especially those widely spoken in regions with diverse populations, would greatly expand the chatbot's reach. For example, including languages such as Hindi, Kannada, or Gujarati could make it accessible to a broader user base in India.

##### Enhancing Intent Prediction:

To improve the chatbot's performance, additional training data, more sophisticated models (such as transformer-based models like BERT), and better natural language understanding algorithms could be implemented. This would help the system handle more complex, ambiguous queries and provide more accurate responses.

##### Contextual Conversations:

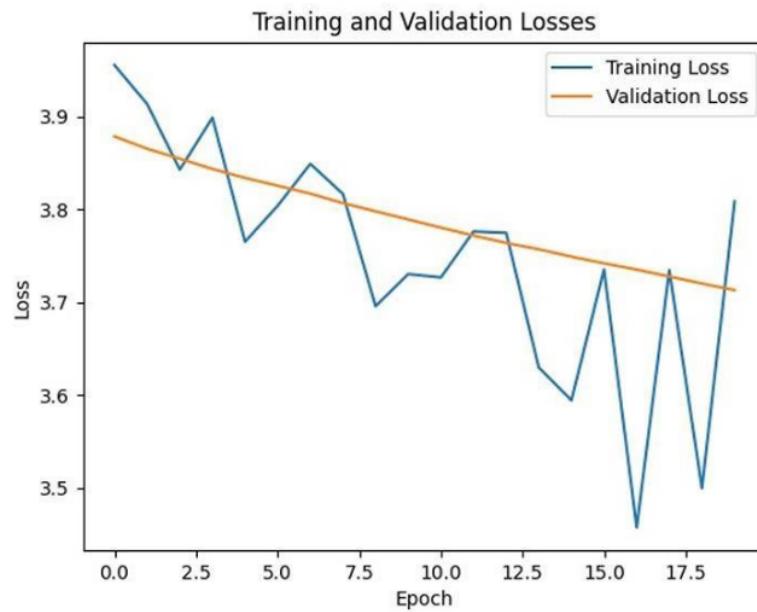
Implementing context tracking for multi-turn conversations would allow the chatbot to follow up on previous queries, providing a more conversational and personalized experience for the user. This could include tracking a user's case history or ongoing legal issues.

##### Integration with Legal Databases:

A major enhancement would be to connect the chatbot to live legal databases or government resources. This would enable the system to provide up-to-date legal information, such as recent changes in law, current legal precedents, or even links to relevant legal documents.

**Interactive Legal Resources:**

The chatbot could be enhanced with interactive features such as legal document templates (e.g., contracts, wills), checklists, or simple decision trees that guide users through legal processes, further adding value.

**TRAINING GRAPH:**

*Figure 10*

## CHAPTER 5

### 5.1 CONCLUSION AND WORKSPACE

In conclusion, the AI-assisted chatbot for legal information represents a significant step toward making legal services more accessible and user-friendly. By integrating both text and voice functionalities in multiple languages, including English and Tamil, the chatbot bridges the communication gap for users across diverse regions. Phase 2 of the project, which focuses on enhancing voice output capabilities, will further empower users to easily access legal information in real-time.<sup>19</sup> The use of Python Flask for backend development and React for the frontend, along with the robust PyTorch-based neural networks, ensures a scalable and efficient system. Ultimately, this chatbot not only enhances the legal experience but also sets the stage for future innovations in AI-assisted legal technology, bringing both convenience and clarity to individuals seeking legal guidance.

#### Initial Development

Backend: Set up Python Flask to handle API requests and responses. Integrate core NLP models for legal document interpretation.

Frontend: Build a user interface using React, ensuring a smooth interaction for users seeking legal advice.

Text-Based Output: Enable the chatbot to respond with written legal information.

Language Support: Incorporate basic support for English and Tamil.

#### Voice Output Enhancement

Voice Recognition Integration: Implement speech recognition for input queries.

Text-to-Speech (TTS): Enhance voice output to respond audibly in both English and Tamil, leveraging natural-sounding voice synthesis.

User Testing: Conduct user testing to assess the effectiveness and clarity of voice interactions.

### Advanced Features & Scaling

Legal Knowledge Expansion: Enhance the chatbot's knowledge base to include more legal domains and specializations.

Multilingual Support: Add more languages to ensure broader accessibility, allowing users from different linguistic backgrounds to access legal information.

AI Model Training: Improve the neural network models by training them with additional legal data for more accurate legal advice.

## 5.2 FOR PHASE 2

Phase 2 of the **AI-Assisted Lawyer Chatbot** project shifts its primary focus towards improving the **voice output functionality** in both **English** and **Tamil**. The goal is to make the chatbot more user-friendly, especially for those who prefer auditory interactions, have visual impairments, or are more comfortable in their native language. By expanding voice capabilities, the chatbot will provide a seamless, multilingual, voice-enabled experience, delivering legal information in a natural, conversational manner.

### 1. Voice Output in English and Tamil

One of the most important goals of Phase 2 is to enhance the chatbot's ability to output legal information through text-to-speech (TTS) in both English and Tamil. While Phase 1 allowed users to interact via voice input, the responses were limited to text, which could sometimes be inconvenient, especially for users who prefer voice-based interaction.

Multilingual Output: The chatbot will be able to provide legal information verbally in both English and Tamil. Users can receive information in their preferred language, ensuring that the response is natural and culturally appropriate.

English Voice Output: The chatbot will provide voice responses in clear, professional English with a natural, fluent tone. This will help users who are more

comfortable with English legal terms receive accurate information in a familiar language.

**Tamil Voice Output:** For Tamil-speaking users, the chatbot will utilize high-quality Tamil TTS systems to convert text-based legal information into natural Tamil speech. The translation of legal terminology will be enhanced in Phase 2 to ensure that complex legal terms are accurately conveyed in Tamil, maintaining clarity and professionalism.

## 2. Improved User Interaction

With the inclusion of voice output, the chatbot will become even more interactive and user-friendly, allowing for a more conversational experience. Users will not only be able to speak their queries to the chatbot but also listen to the responses in real-time, making the overall experience faster and more engaging.

**Engagement through Voice:** Rather than reading text-based responses, users will receive legal information delivered audibly, which can be particularly beneficial for users with visual impairments or those who are unable to read text for other reasons.

In Phase 2, special attention will be given to ensuring that the voice output in both English and Tamil is not only accurate but also sounds natural and engaging. The chatbot's intonation, stress on legal terms, and overall fluency will be refined to mimic human-like speech, making it easier for users to understand complex legal information. In Tamil, the system will focus on handling regional variations in pronunciation to ensure that speakers from different parts of Tamil Nadu or other Tamil-speaking regions can relate to the voice output. By incorporating emphasis on key legal points and making the speech more conversational, the voice output will bridge the gap between text-heavy legal content and more accessible, digestible auditory responses, greatly enhancing the overall user experience.

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## APPENDIX

### APPENDIX 1

#### LIST OF PUBLICATIONS

##### 1.PUBLICATION STATUS: APPLIED

**TITLE OF THE PAPER:** AI Voice Assistant For Legal Information Using GenAI

**AUTHORS:** Ms. S.NAGOMIYA, MURSHID AHMED S, NIKHIL P

26

**NAME OF THE CONFERENCE:** InCACCT-2025-3rd International Conference on Advancement in Computation & Computer Technologies

**CONFERENCE DATE:** 17 APRIL 2025

**APPENDIX 2:****IMPLEMENTATION CODE :**

```

from flask import Flask, request, jsonify
13
import torch

from model import NeuralNet

from nltk_utils import bag_of_words, tokenize

import json

from flask_cors import CORS

from deep_translator import GoogleTranslator


app = Flask(__name__)

CORS(app, resources={"/chat": {"origins": "http://localhost:3000"}})

# Load model and data
2
device = torch.device('cuda' if torch.cuda.is_available() else 'cpu')

FILE = "data.pth"

intents_file = "intents.json"

# Load model parameters and initialize model
2
data = torch.load(FILE)

input_size = data["input_size"]

hidden_size = data["hidden_size"]

```

```
output_size = data["output_size"]

all_words = data["all_words"]

tags = data["tags"]

model_state = data["model_state"]

model = NeuralNet(input_size, hidden_size, output_size).to(device)

model.load_state_dict(model_state)

model.eval()

# Load intents
2
with open(intents_file, 'r') as f:

    intents = json.load(f)

# Translator setup

def translate_to_english(text):

    return GoogleTranslator(source='auto', target='en').translate(text)

def translate_to_tamil(text):

    return GoogleTranslator(source='en', target='ta').translate(text)

# Chat route
20
@app.route('/chat', methods=['POST'])
```

```
def chat():

    data = request.get_json()

    message = data['message']

    print(message)

    # Translate input to English if necessary

    translated_message = translate_to_english(message)

    print(translated_message)

    sentence = tokenize(translated_message)

2    X = bag_of_words(sentence, all_words)

    X = X.reshape(1, X.shape[0])

    X = torch.from_numpy(X).to(device)

# Model prediction

    output = model(X)

    _, predicted = torch.max(output, dim=1)

    tag = tags[predicted.item()]

# Probability threshold

    probs = torch.softmax(output, dim=1)

    prob = probs[0][predicted.item()]

    if prob.item() > 0.75:

        for intent in intents['intents']:
```

```
if tag == intent["intent"]:  
    response = intent["response"]  
  
    # Translate response to Tamil if the input was Tamil  
    if message != translated_message: # Indicates original input was not in  
        English  
        response = translate_to_tamil(response)  
  
    return jsonify({"message": response})  
  
fallback_response = "I'm not sure how to respond to that."  
  
if message != translated_message:  
    fallback_response = translate_to_tamil(fallback_response)  
  
return jsonify({"message": fallback_response})  
  
if __name__ == "__main__":  
    app.run(debug=True)
```



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