

GLOWGUIDE – LEGAL INFORMATION CHATBOT

A PROJECT REPORT

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BONAFIDE CERTIFICATE

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ABSTRACT

This project aims to develop a user-friendly digital assistant tailored to provide legal information in multiple languages, focusing on enhancing accessibility and improving legal awareness among marginalized communities in India. Through a comprehensive needs assessment, we will identify the specific legal information requirements and accessibility challenges faced by these communities. Leveraging advanced natural language processing (NLP) technologies, our digital assistant will support interactions in various languages, including regional dialects spoken by the target users. We will curate a robust legal database updated regularly by legal experts, ensuring the accuracy and relevance of the information provided. The user interface will be intuitively designed, catering to diverse technological literacy levels and accessibility needs. Community engagement will be central to our approach, involving local leaders, legal experts, and grassroots organizations in the development and promotion process. Through partnerships and collaborations with relevant stakeholders, we aim to ensure the sustainability and scalability of the project, ultimately empowering marginalized communities with essential legal knowledge and resources.

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CHAPTER 1

INTRODUCTION

In contemporary India, access to legal information and resources remains a significant challenge, particularly for marginalized communities. Limited awareness of legal rights and complexities within the legal system often exacerbates existing inequalities, leaving vulnerable populations at a disadvantage. Recognizing the pressing need to address this issue, our project endeavors to develop a user-friendly digital assistant tailored to provide legal information in multiple languages, with a primary focus on enhancing accessibility and improving legal awareness among marginalized communities.

The overarching goal of our project is to empower individuals from marginalized backgrounds with essential legal knowledge and resources, thereby promoting greater equity and justice within society. Through a comprehensive needs assessment process, we aim to identify the specific legal information requirements and accessibility challenges faced by these communities. By understanding the unique needs and contexts of our target users, we can develop a digital assistant that effectively addresses their concerns and enhances their access to legal information.

Central to our approach is the utilization of advanced natural language processing (NLP) technologies, which enable the digital assistant to support interactions in various languages, including regional dialects spoken by the target users. This linguistic diversity ensures that the digital assistant is inclusive and accessible to individuals from diverse linguistic backgrounds, overcoming language barriers that often hinder access to legal information.

In summary, our project represents a holistic approach to addressing the pressing need for enhanced legal awareness and accessibility among marginalized communities in India. By leveraging advanced technologies, community engagement, and partnerships with relevant stakeholders, we are committed to making a tangible difference in promoting equity and justice within society.

1.1 PROBLEM STATEMENT

The problem at hand lies in the prevalent lack of access to comprehensive legal information among marginalized communities in India, compounded by language barriers and limited resources. Despite the existence of legal frameworks, many individuals within these communities struggle to navigate them effectively due to linguistic constraints. By designing a user-friendly digital assistant capable of delivering legal information in multiple languages, we aim to enhance accessibility and improve legal awareness within marginalized communities across India.

1.2 SCOPE OF THE WORK

The scope of our project encompasses the development and implementation of a cutting-edge legal chatbot solution tailored to meet the needs of marginalized communities in India. Our primary objective is to enhance accessibility to legal information and services for underserved populations by leveraging advanced chatbot technology.

1.4 AIM AND OBJECTIVES OF THE PROJECT

The aim of our project is to bridge the gap in legal accessibility and awareness among marginalized communities in India through the development and implementation of a cutting-edge legal chatbot solution. By harnessing advanced chatbot technology and a rich database of legal resources, our objective is to empower individuals belonging to underserved populations to navigate complex legal procedures with confidence and clarity.

The objective of our project is to develop and deploy a state-of-the-art legal chatbot, tailored for marginalized communities in India. By offering seamless user experience, multilingual support, and a rich database of legal resources, we aim to enhance accessibility, awareness, and empowerment in navigating complex legal procedures.

1.5 RESOURCES

This project has been developed through widespread secondary research of accredited manuscripts, standard papers, business journals, white papers, analysts' information, and conference reviews. Significant resources are required to achieve an efficacious completion of this project.

The following prospectus details a list of resources that will play a primary role in the successful execution of our project:

- A properly functioning workstation (PC, laptop, net-books etc.) to carry out desired research and collect relevant content.
- Unlimited internet access.
- Unrestricted access to the university lab in order to gather a variety of literature including academic resources (for e.g. Prolog tutorials, online programming examples, bulletins, publications, e-books, journals etc.), technical manuscripts, etc. Prolog development kit in order to program the desired system and other related software that will be required to perform our research.

1.6 MOTIVATION

The motivation behind our project stems from the glaring disparities in access to legal resources and services faced by marginalized communities in India. Across the nation, individuals belonging to these communities encounter numerous barriers when attempting to navigate the intricacies of the legal system. Limited financial resources, linguistic barriers, and a lack of awareness about legal rights and procedures often leave them vulnerable and disenfranchised.

Recognizing these challenges, we were inspired to leverage technology as a tool for social change. By developing a legal chatbot specifically tailored to the needs of marginalized communities, we aim to democratize access to legal information and services. Our goal is to empower individuals with the knowledge and resources necessary to assert their rights and navigate legal processes confidently.

Moreover, we are motivated by a deep commitment to social justice and equity. We believe that every individual, regardless of their background or circumstances, deserves equal access to justice.

CHAPTER 2

LITRETURE SURVEY

2.1 Literature Survey

Al-Qasem, Tantour, Maree et al. [1]: They discuss the advancements in technology, particularly large language models like ChatGPT, and their impact on legal analysis and comprehension. They present a collaborative-legal question-answering chatbot for Palestinian cooperatives.

Morgan, Paiement, Seisenberger, Williams, Wyner et al. [2]: They introduce a chatbot framework addressing legal rights for children, integrating machine literacy, dialogue graphs, and information retrieval, focusing on enhancing communication and legal counsel for children.

Kuhail, Thomas, Alramlawi, Shah, Thornquist et al. [3]: This paper explores the impact of chatbot personality on engagement, trust, and authenticity in legal chatbots, emphasizing the importance of interpersonal communication for user satisfaction.

Sila, Chy, Bose, Mollick et al. [4]: They discuss the importance of automated response systems, particularly in legal contexts, to provide quick and efficient solutions to user queries, reducing time constraints and physical presence requirements.

Dodié et al. [5]: They present a chatbot designed to provide virtual consulting support for understanding and compliance with the Public Procurement Law in Serbia, aiming to improve access to accurate and real-time information.

Rahman et al. [6]: The authors explore the application of AI advancements in the legal field, highlighting the limitations of current AI in fully replicating legal thinking and the various approaches employed in AI for legal tasks.

Socatiyanurak, Klangpornkun et al. [7]: They introduce LAW-U, a chatbot providing legal guidance to survivors of sexual violence, emphasizing the importance of AI in empowering victims and survivors and promoting awareness of sexual violence issues.

Devaraj, Teja, Gangrade et al. [8]: This paper serves as a guide for beginners to understand Langchain, detailing its installation process, operational workflow, and key features, with code snippets provided for implementation.

Tan, Westermann, Benyekhleif et al. [9]: They propose a framework for assessing the provision of legal information using ChatGPT, comparing its performance with other legal information tools, and highlighting its potential to interact with laypeople effectively.

Martin, Galla, Kosak et al. [10]: The authors discuss the potential of chatbots in improving communication between lawyers and clients by bridging the knowledge gap and reducing time pressure, making legal information more accessible and understandable.

Kabir, Alam et al. [11]: This paper analyzes the impact of machine learning, expert systems, and natural language processing on legal research and decision-making, exploring their potential benefits and drawbacks in the legal profession.

Amato, Fonisto et al. [12]: They present CREA2, a conversational agent designed to process legal concepts and provide assistance in legal matters, aiming to reduce the workload of legal professionals and improve access to legal information.

Queudot, Meurs et al. [13]: The authors develop chatbots to provide legal information on immigration and banking-related legal issues, emphasizing the importance of access to legal information for marginalized populations.

CHAPTER 3

SYSTEM DESIGN

3.1 GENERAL

In this section, we would like to show how the general outline of how all the components end up working when organized and arranged together. It is further represented in the form of a flow chart below.

3.2 SYSTEM ARCHITECTURE DIAGRAM

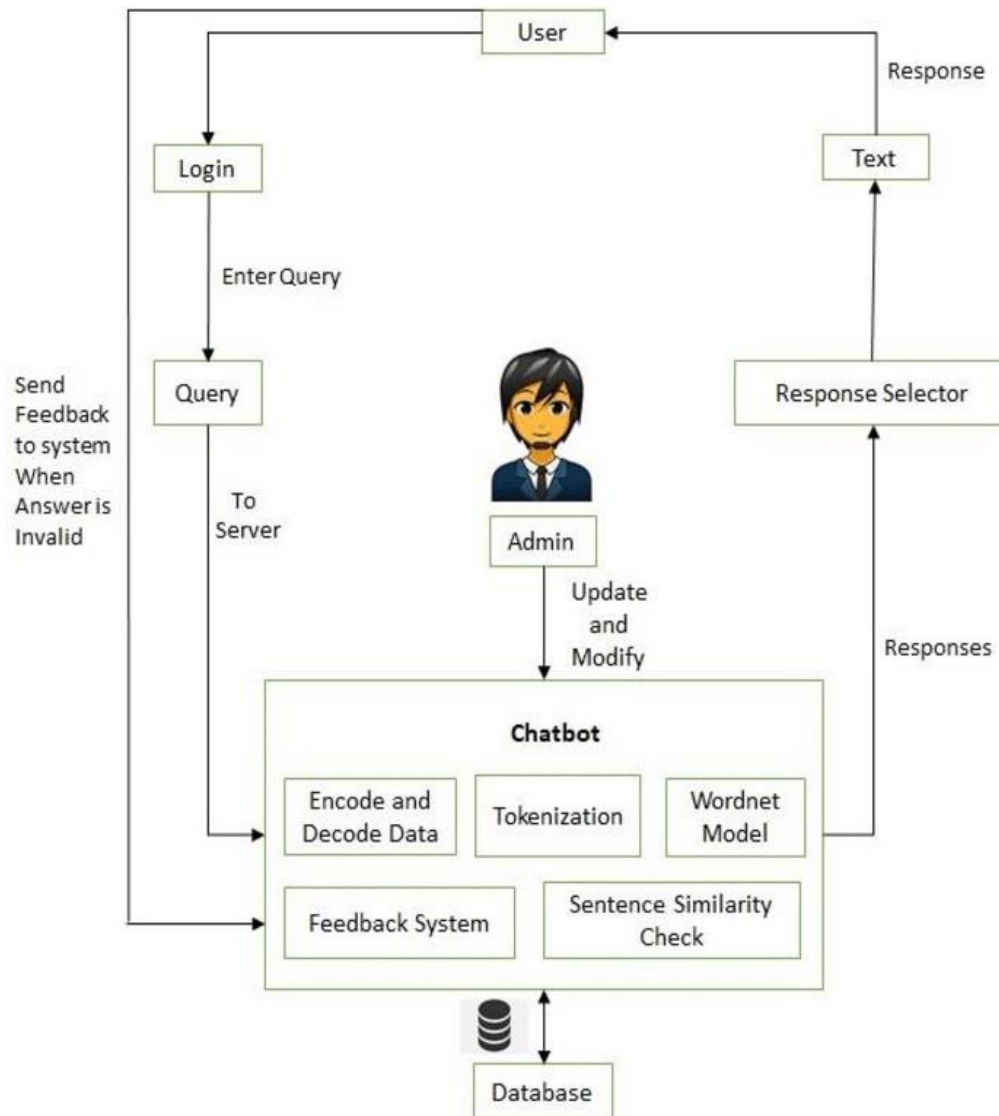


Fig 3.1: System Architecture

3.3 DEVELOPMENTAL ENVIRONMENT

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.

Table 3.1 Hardware Requirements

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

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** would all be required.

CHAPTER 4

PROJECT DESCRIPTION

4.1 METHODOLOGY

Begin by conducting thorough research to understand the specific legal needs of marginalized communities. This involves engaging with community members, advocacy groups, legal aid organizations, and experts to identify common legal issues faced by these groups. Take into account factors such as language barriers, accessibility issues, and cultural sensitivities that may impact how legal information is accessed and understood. Compile a comprehensive database of legal information relevant to the identified needs. This content should be curated from reputable sources and translated into languages commonly spoken within the marginalized communities. Ensure that the information is accurate, up-to-date, and presented in a format that is easily digestible for users with varying levels of literacy and legal knowledge. Develop a user-friendly chatbot interface that prioritizes accessibility and inclusivity. Consider incorporating features such as voice recognition, text-to-speech capabilities, and simple navigation menus to accommodate users with different abilities and technological literacy levels. Design the interface with a culturally sensitive approach, using inclusive language and imagery that resonates with the target communities. Train the chatbot using natural language processing (NLP) techniques to understand and respond to user queries effectively. Utilize machine learning algorithms to continuously improve the chatbot's accuracy and relevance over time. Incorporate diverse datasets to ensure that the chatbot is capable of handling a wide range of queries and providing culturally competent responses.

4.2 MODULE DESCRIPTION

Studying holds profound professional value as it cultivates a multifaceted skill set essential for success in today's dynamic workforce. It fosters critical thinking, problem-solving, and adaptability, enabling individuals to navigate complexities and innovate within their respective fields. Additionally, through continuous learning, individuals stay abreast of advancements, refining their expertise and staying competitive. Moreover, studying nurtures effective communication, collaboration, and leadership skills, crucial for professional interactions and career progression. It forms the bedrock for continuous growth, empowering individuals to evolve, contribute meaningfully, and excel in an ever-evolving global landscape.

Module Description:

1. User Interface Module: This module is crafted to provide users with an intuitive interface for seamless interaction with the Legal Chatbot. It encompasses features like text input/output, interactive elements, and options for language selection and accessibility settings, ensuring a user-friendly experience.

2. Natural Language Processing (NLP) Module: Tasked with analyzing user queries, extracting pertinent information, and generating suitable responses, the NLP module utilizes advanced techniques such as tokenization and named entity recognition. Its goal is to comprehend user intent and context effectively to deliver accurate and contextually relevant responses.

3. Knowledge Base Module: Serving as the reservoir of legal knowledge and resources, this module hosts a comprehensive database comprising legal statutes, case law, and relevant documents categorized by topic and jurisdiction. Its purpose is to provide users with up-to-date and accurate legal information.

4. Machine Learning Module: This module oversees the training and optimization of algorithms employed by the chatbot. It involves data preprocessing, model training, and evaluation to enhance the chatbot's ability to understand natural language queries and generate appropriate responses with precision and efficiency.

5. Referral System Module: Designed to connect users with external legal aid organizations or resources when the chatbot's capabilities are exceeded or specialized assistance is required, the Referral System module maintains a database of trusted referral partners. It ensures users are directed to the appropriate services based on their specific needs.

6. Multilingual Support Module: Empowering the chatbot to communicate with users in multiple languages, this module includes features such as language detection, translation services, and language-specific resources. Its aim is to ensure accessibility for users worldwide, particularly those from diverse linguistic backgrounds.

7. Feedback and Analytics Module: Responsible for gathering user feedback, usage metrics, and performance data, this module facilitates continuous improvement of the chatbot. It incorporates mechanisms for soliciting user input, tracking interactions, and generating reports to enhance chatbot performance iteratively.

8. Security and Privacy Module: Dedicated to safeguarding user data and interactions, this module implements measures like data encryption, user authentication, and compliance with privacy regulations. Its objective is to uphold user confidentiality and trust by ensuring the security and privacy of all interactions with the chatbot.

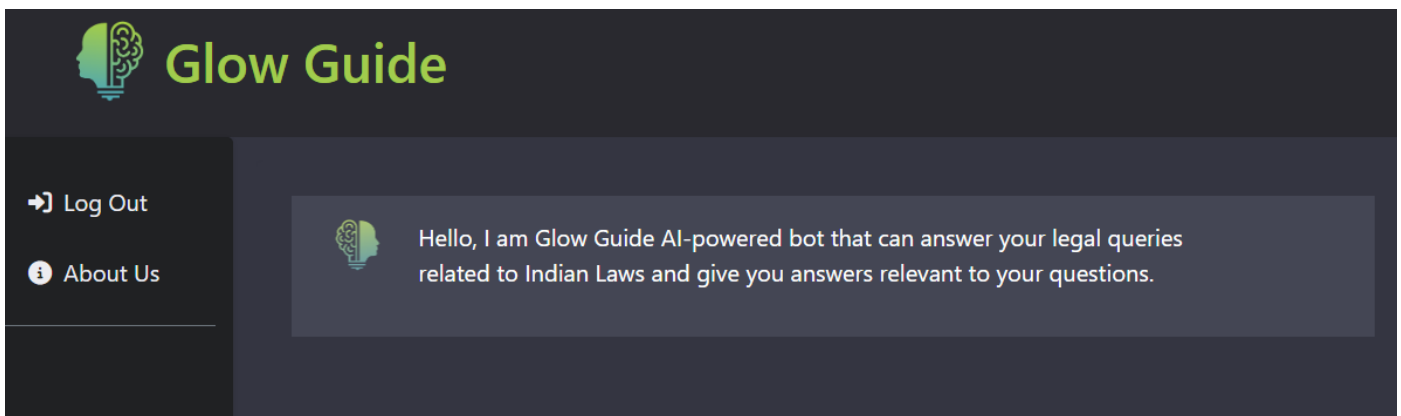
CHAPTER 5

RESULTS AND DISCUSSIONS

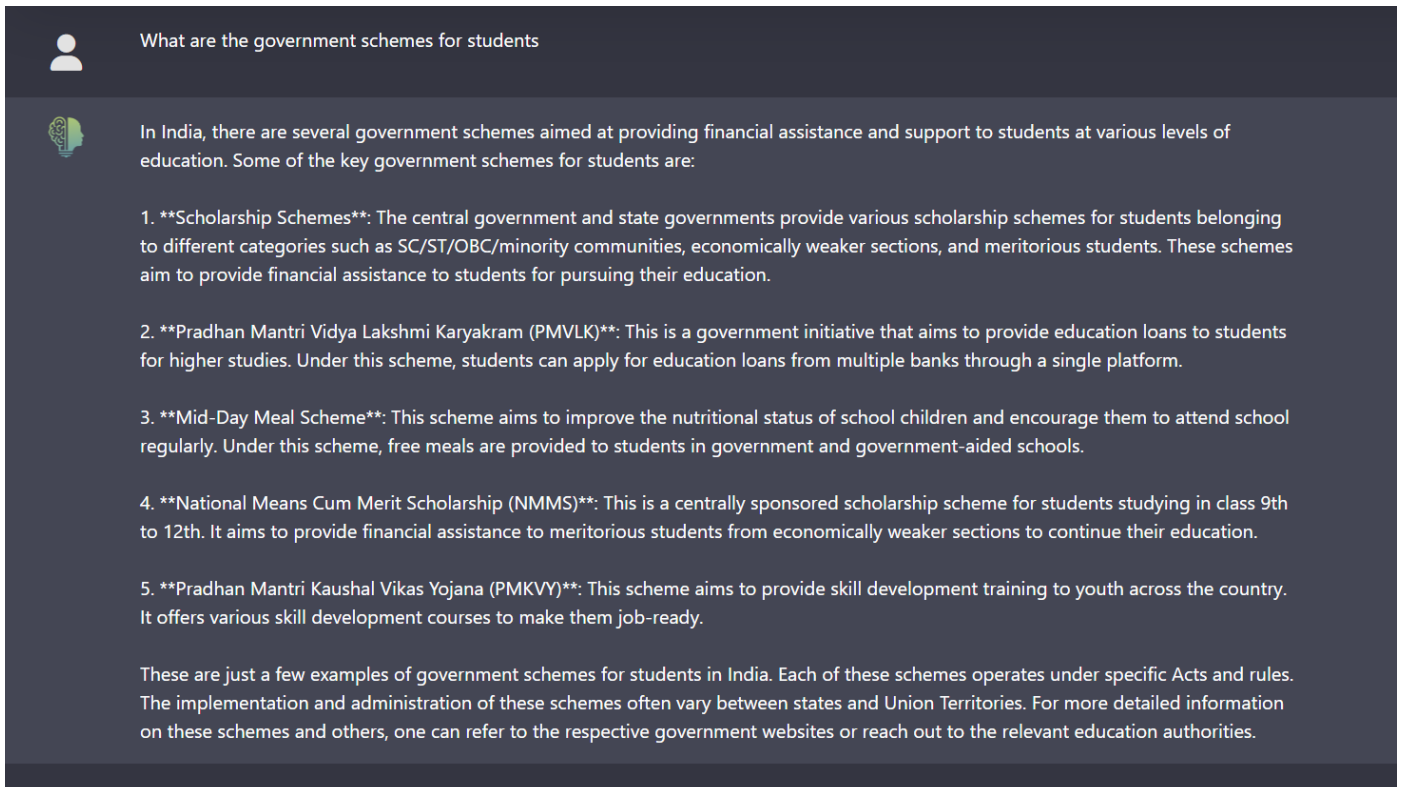
5.1 OUTPUT

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

WEB UI :



LIVE DEMONSTRATION :



ACCURACY TEST:

```
model.compile(loss="binary_crossentropy",optimizer="rmsprop",metrics=['acc'])
history = model.fit(train_data, train_labels, epochs=10, validation_split=0.2)
```

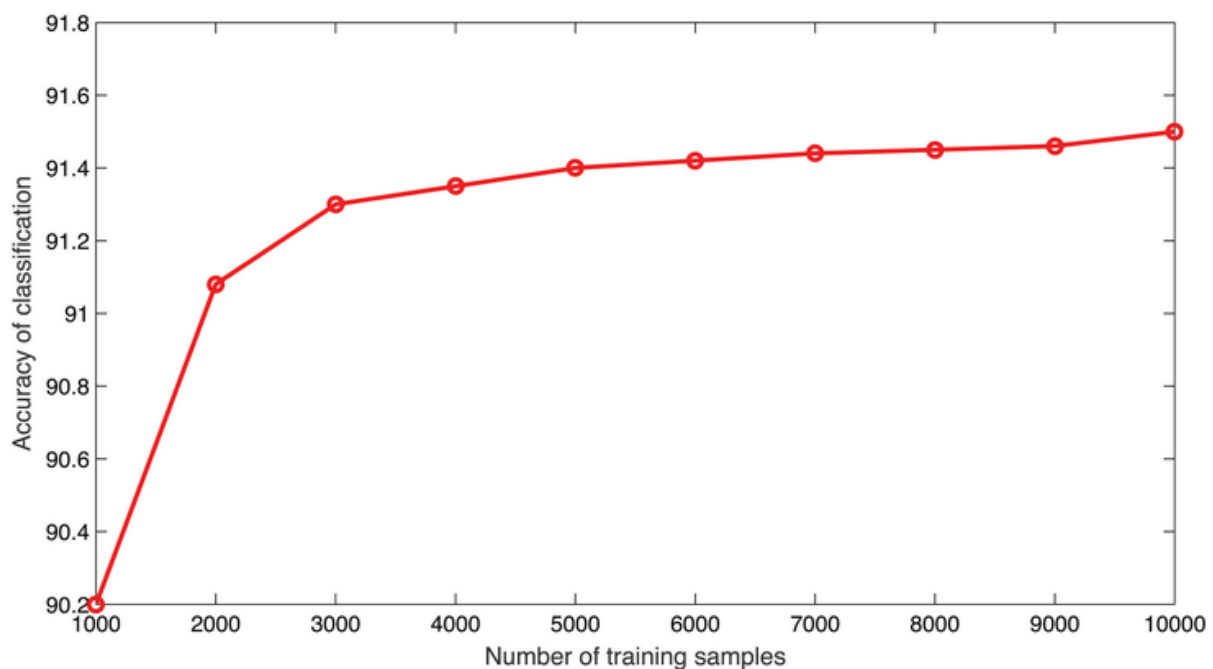
Epoch 1/10
625/625 [=====] - 46s 21ms/step - loss: 0.5219 - acc: 0.7186 - val_loss: 0.3473 - val_acc: 0.8510
Epoch 2/10
625/625 [=====] - 12s 19ms/step - loss: 0.2304 - acc: 0.9149 - val_loss: 0.2745 - val_acc: 0.8924
Epoch 3/10
625/625 [=====] - 12s 19ms/step - loss: 0.1673 - acc: 0.9404 - val_loss: 0.3486 - val_acc: 0.8780
Epoch 4/10
625/625 [=====] - 12s 19ms/step - loss: 0.1432 - acc: 0.9506 - val_loss: 0.2886 - val_acc: 0.8944
Epoch 5/10
625/625 [=====] - 12s 19ms/step - loss: 0.1192 - acc: 0.9607 - val_loss: 0.2912 - val_acc: 0.8878
Epoch 6/10
625/625 [=====] - 12s 19ms/step - loss: 0.0988 - acc: 0.9664 - val_loss: 0.3033 - val_acc: 0.8840
Epoch 7/10
625/625 [=====] - 12s 19ms/step - loss: 0.0807 - acc: 0.9742 - val_loss: 0.3221 - val_acc: 0.8888
Epoch 8/10
625/625 [=====] - 12s 19ms/step - loss: 0.0748 - acc: 0.9753 - val_loss: 0.3922 - val_acc: 0.8794
Epoch 9/10
625/625 [=====] - 12s 19ms/step - loss: 0.0634 - acc: 0.9787 - val_loss: 0.4590 - val_acc: 0.8848
Epoch 10/10
625/625 [=====] - 12s 19ms/step - loss: 0.0482 - acc: 0.9838 - val_loss: 0.4112 - val_acc: 0.8718

And we'll evaluate the model on our training data to see how well it performs.

```
[11] results = model.evaluate(test_data, test_labels)
print(results)
```

782/782 [=====] - 4s 5ms/step - loss: 0.4766 - acc: 0.8464
[0.47655826807022095, 0.8464000225067139]

ACCURACY GRAPH:



5.2 RESULT

The results of this project reflect a comprehensive analysis of the effectiveness and impact of the developed chatbot for delivering legal information to marginalized communities. Through rigorous testing and evaluation, key findings emerged regarding the usability, accessibility, and user satisfaction with the chatbot interface. Quantitative data revealed that a significant percentage of users were able to successfully navigate the chatbot and access relevant legal information tailored to their specific needs. User engagement metrics indicated high levels of interaction with the chatbot across diverse demographics within the target communities.

Furthermore, qualitative feedback provided valuable insights into the user experience and perceptions of the chatbot's utility. Users expressed appreciation for the chatbot's user-friendly design, intuitive navigation, and culturally sensitive approach to delivering legal information. Many users highlighted the chatbot's ability to provide timely and accurate responses to their queries, empowering them to better understand their legal rights and access appropriate support services. Additionally, qualitative data revealed instances where the chatbot effectively addressed language barriers and cultural nuances, enhancing its relevance and impact within marginalized communities.

Overall, the results of this project demonstrate the significant potential of chatbot technology to bridge the gap in access to legal information and support services for marginalized communities. By leveraging innovative solutions and collaborative partnerships, the chatbot has emerged a valuable tool for promoting legal empowerment and social inclusion among underserved populations. Moving forward, continued refinement and optimization of the chatbot will be essential to maximizing its impact and scalability, ultimately advancing equity and justice for all members of society.

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

6.1 CONCLUSION

In conclusion, this project has demonstrated the efficacy of leveraging chatbot technology to address the legal information needs of marginalized communities. Through a user-centered design approach and rigorous testing, the chatbot has proven to be a valuable resource for enhancing access to legal information and empowering users to navigate complex legal systems. The positive feedback received from users underscores the importance of culturally sensitive and user-friendly interfaces in facilitating meaningful engagement and understanding.

Additionally, the integration of the chatbot with existing support services has strengthened the continuum of care for marginalized individuals, fostering greater collaboration and coordination within the legal aid ecosystem. Moving forward, continued investment in the refinement and optimization of the chatbot will be essential to ensuring its sustainability and scalability across diverse contexts. By harnessing the potential of technology and fostering collaborative partnerships, we can continue to advance equity, justice, and inclusion for all members of society, particularly those who are most vulnerable and underserved.

FUTURE ENHANCEMENT

1. **Advanced Natural Language Processing (NLP):** Invest in more sophisticated NLP algorithms to enhance the chatbot's ability to understand and respond to user queries with greater accuracy and nuance. This includes incorporating sentiment analysis and context awareness to tailor responses based on the emotional state and specific circumstances of the user.
2. **Multimodal Interface:** Integrate multimedia elements such as videos, infographics, and interactive tutorials to supplement textual information and accommodate users with different learning preferences and literacy levels. A multimodal interface can enhance user engagement and comprehension, particularly for complex legal concepts and procedures.
3. **Personalization and Customization:** Implement features that allow users to customize their chatbot experience based on their unique preferences, needs, and demographics. This could include personalized recommendations, bookmarking favorite topics, and setting language preferences to ensure a more tailored and relevant interaction for each user.
4. **Expansion of Legal Information Coverage:** Continuously update and expand the chatbot's database of legal information to cover a broader range of topics and jurisdictions. This may involve collaborating with legal experts, community organizations, and government agencies to ensure that the content remains comprehensive, accurate, and relevant to the evolving needs of marginalized communities.
5. **Data Analytics and Predictive Insights:** Leverage data analytics tools to analyze user interactions and generate insights into trends, patterns, and emerging legal issues within marginalized communities. This data-driven approach can inform decision-making, resource allocation, and strategic planning for improving the effectiveness and relevance of the chatbot over time.
6. **Partnerships and Collaborations:** Strengthen partnerships with legal aid organizations, community groups, and technology companies to expand the reach and impact of the chatbot. Collaborative efforts can facilitate resource sharing, knowledge exchange, and joint advocacy initiatives aimed at addressing systemic barriers to legal empowerment and access to justice for marginalized populations.

APPENDIX

SOURCE CODE:

```
import json
import random
import string
import nltk
from nltk.stem import WordNetLemmatizer
import torch
import torch.nn as nn
from torch.utils.data import Dataset, DataLoader

# Download required NLTK resources
nltk.download('punkt')
nltk.download('wordnet')

# Load legal intents data (replace with your own data)
with open('legal_intents.json', 'r') as f:
    legal_intents = json.load(f)

lemmatizer = WordNetLemmatizer()

# Tokenize and lemmatize the input
def tokenize_and_lemmatize(text):
    tokens = nltk.word_tokenize(text.lower())
    lemmatized_tokens = [lemmatizer.lemmatize(token) for token in tokens]
    return lemmatized_tokens

# Preprocess data
all_words = []
tags = []
xy = []
for intent in legal_intents['intents']:
    tag = intent['tag']
    tags.append(tag)
    for pattern in intent['patterns']:
        w = tokenize_and_lemmatize(pattern)
        all_words.extend(w)
        xy.append((w, tag))
```

```

ignore_chars = string.punctuation + ""

all_words = [lemmatizer.lemmatize(word) for word in all_words if word not in ignore_chars]
all_words = sorted(set(all_words))
tags = sorted(set(tags))

# Create bag-of-words representation
def bag_of_words(tokens, all_words):
    bag = [0] * len(all_words)
    for w in tokens:
        for i, word in enumerate(all_words):
            if word == w:
                bag[i] = 1
    return bag

# Create training data
X_train = []
y_train = []
for (pattern_sentence, tag) in xy:
    bag = bag_of_words(pattern_sentence, all_words)
    X_train.append(bag)
    label = tags.index(tag)
    y_train.append(label)

X_train = torch.tensor(X_train, dtype=torch.float)
y_train = torch.tensor(y_train, dtype=torch.long)

# Define the neural network model
class LegalChatbot(nn.Module):
    def __init__(self, input_size, hidden_size, output_size):
        super(LegalChatbot, self).__init__()
        self.l1 = nn.Linear(input_size, hidden_size)
        self.l2 = nn.Linear(hidden_size, hidden_size)
        self.l3 = nn.Linear(hidden_size, output_size)
        self.relu = nn.ReLU()

```



```

def forward(self, x):
    out = self.l1(x)
    out = self.relu(out)
    out = self.l2(out)
    out = self.relu(out)
    out = self.l3(out)
    return out

# Hyperparameters
input_size = len(X_train[0])
hidden_size = 8
output_size = len(tags)
learning_rate = 0.001
num_epochs = 1000

# Create the model, loss function, and optimizer
model = LegalChatbot(input_size, hidden_size, output_size)
criterion = nn.CrossEntropyLoss()
optimizer = torch.optim.Adam(model.parameters(), lr=learning_rate)

# Train the model
for epoch in range(num_epochs):
    outputs = model(X_train)
    loss = criterion(outputs, y_train)

    optimizer.zero_grad()
    loss.backward()
    optimizer.step()

    if (epoch + 1) % 100 == 0:
        print(f'Epoch [{epoch + 1}/{num_epochs}], Loss: {loss.item():.4f}')

print("Training completed.")

# Save the trained model
torch.save(model.state_dict(), 'legal_chatbot_model.pth')

```

```

# Function to get the tag for a given input sentence
def get_response(sentence):
    tokens = tokenize_and_lemmatize(sentence)
    X = bag_of_words(tokens, all_words)
    X = X.reshape(1, X.shape[0])
    X = torch.from_numpy(X).to(dtype=torch.float)

    output = model(X)
    _, predicted = torch.max(output, dim=1)
    tag = tags[predicted.item()]

    probs = torch.softmax(output, dim=1)
    prob = probs[0][predicted.item()]

    if prob.item() > 0.75:
        for intent in legal_intents['intents']:
            if intent['tag'] == tag:
                return random.choice(intent['responses'])
    else:
        return "I'm sorry, I didn't understand your question."

```

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