

An Artificial Neural Network-Powered Intelligent Chatbot System for Women's Legal Rights Awareness and Assistance in India

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Abstract. In fact, many women in India may find it hard to get proper legal advice. This is mainly because lack of knowledge about legal terms and the complexity involved in legal procedures. Unfortunately, most of today's legal chatbot solutions depend on set rules and are not very accurate to the different questions that users may have. This report presents a smart chat-bot solution using Artificial Neural Networks (ANNs), designed specifically to improve women's knowledge of their legal rights and provide them with assistance all over India. The proposed solution combines natural language processing (NLP) techniques with an ANN based model to efficiently categorize the user's queries into major legal categories. These include important issues such as domestic violence, dowry harassment, sexual misconduct in the workplace, cybercrimes, and property rights. Once the system has determined the specific need of the user, it provides straightforward explanations of the legal terms and procedures for resolving the issue. The learning ability of the ANN makes the system's responses accurate and flexible, providing a better solution than the existing keyword-based approach. This ultimately makes it a very useful tool for legal assistance with a special focus on women.

Keywords: Artificial Neural Network (ANN), Intelligent Chatbot, Women's Legal Rights, Legal Awareness System, Natural Language Processing (NLP), Women-Centric Legal Assistance, Indian Legal Framework, Machine Learning-Based Chatbot

1. INTRODUCTION

Now-a-days many women face problems in gaining access to the right legal information, especially in critical situations such as cases of domestic violence, sexual harassment, human trafficking, and matters related to the protection of women and children. Legal provisions are often spread out in various laws and sections, making it difficult for people to immediately identify the correct law or procedure related to their problem. To counter this problem, our project proposes the use of an Intelligent Legal Information Retrieval and Assistance System. This system provides users with relevant legal provisions and procedures based on their natural language queries. Our project uses Natural Language Processing, Machine Learning, and Semantic Search technologies to provide legal information. Whenever the users ask query to the system, it analyzes the query and provides most legal provisions from Indian legal datasets. The system consists of a user-friendly front-end interface which enables easy interaction with the user, and a machine learning engine which serves as the backend for intent classification and legal document retrieval. The aim of the project is to achieve [16] legal awareness, reduce dependence on manual legal research, and enable faster access to legal knowledge.

This project works as a set of interlinked stages, which are designed to process user queries efficiently and provide relevant legal assistance:

User Inquiry Submission: The process begins when the user enters a legal query into the system's interface. The query, typed in natural language, may inquire about factual legal information, procedural guidance, or even emergency legal advice.

Semantic Representation Generation: After the input, the user's query is converted into a numerical form, called an 'embedding'. This process is performed by an advanced Sentence Transformer model. It is essential, because it allows the model to identify the semantic meaning of the query, not just the keyword.

User Intent Identification: The numerical form is then processed by a Multi Layer Perceptron (MLP) neural network. This neural network is specifically trained to detect the primary intent of the user's query, which is then categorized into distinct categories like 'Legal Information', 'Procedural Assistance', 'Emergency', or 'Unknown'.

Relevant Legal Document Retrieval: Based on the same semantic embedding, the system then performs a semantic similarity search on its massive legal document database. By using a FAISS vector index, it quickly

retrieves the top K most relevant legal sections by calculating the cosine similarity of each section to the original query.

Response Synthesis and Presentation: The legal sections are then sorted based on their similarity scores. This sorted information is then combined with the predicted intent and its corresponding score to generate the final response. This complete response includes the detected intent, a confidence score, the relevant [9] legal acts and sections, their corresponding legal texts, and any additional reference links.

Finally, the processed data is sent back to the user interface through an API, where it is formatted in a well-structured and easily simple manner. Enabling Technologies and Methods The system uses different machine learning algorithms and modern technologies:

A. Core Algorithms and Models:

Sentence Transformers (all-MiniLM-L6-v2): Used for creating semantically significant numerical embeddings of the input text, reflecting deep semantic context.

FAISS (Facebook AI Similarity Search): An enabling technology for rapid and efficient searching of large databases of these numerical embeddings, essential for fast document searches.

Multi-Layer Perceptron (MLP): It is a type of neural network used for correctly classifying the user's intent according to the semantic embeddings.

Cosine Similarity: The mathematical [16] formula used to calculate the semantic similarity and relevance of the user's query and the stored legal documents, for effective ranking.

Machine Learning and Natural Language Processing Libraries:

The main functions of the system are built using machine learning and natural language processing libraries such as:

- Sentence Transformers
- TensorFlow / Keras FAISS
- NumPy Pandas
- Scikit-learn

2. LITERATURE SURVEY

The application of artificial intelligence in legal information systems has improved greatly over the past decade. In the beginning, most legal aid systems were based on keyword searches. Users had to enter specific legal terms to find relevant documents. While this method worked well for lawyers and legal professionals, it was not that easy for the general public to use, especially when it comes to sensitive legal matters such as women's rights. To overcome this issue, the legal chatbots based on rules were developed [9]. These chatbots utilized predetermined rules and decision trees to provide answers to legal queries. They provided accurate answers but were not very flexible, as even the slightest variation in the wording of legal queries resulted in incorrect answers. Moreover, the extension of these systems to accommodate various laws and circumstances required a great deal of human effort.

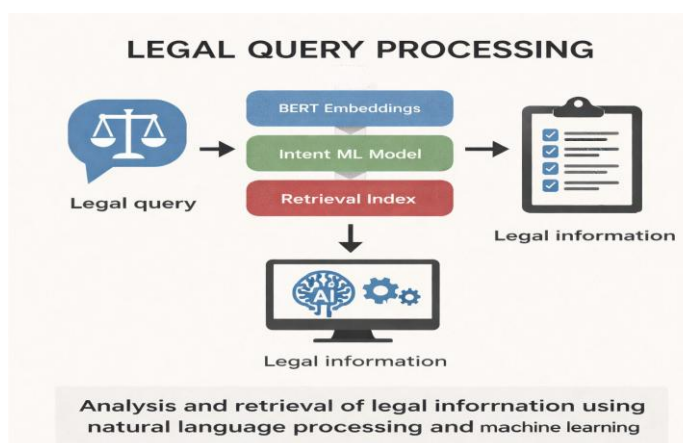


Fig. 1. Analysis retrieval of image information using NLP and ML

TABLE I
KEY FEATURES AND LIMITATIONS IN EXISTING SOLUTIONS

Existing Solution	Key Feature	Limitation
LawPal	Interactive chat interface	Bias and ethical risks

Law-U Legal Guidance	Multi Scenario Conversation	Limited Long text understanding
Intelligent Response	Automated legal assistance for women	Limited handling of complex queries
Legal chatbot	Quick automated responses	Data privacy and security challenges

In recent times, with advancements in Natural Language Processing (NLP) technology, various machine learning algorithms have been used to replace traditional rule-based systems. Techniques such as word embedding and sentence embedding allow for a better understanding of the underlying meaning of user queries, as opposed to focusing on a few keywords. Such advancements are greatly used for improving the accuracy of legal information retrieval, especially for queries posed in natural language. In recent times, various deep learning algorithms have been used to represent legal documents in a compact numerical format. Such numerical representations allow for matching documents relevant to user queries, even if they are posed in a general way. To facilitate faster information retrieval, various vector search engines have been designed to retrieve the most relevant legal documents. In recent times, a new paradigm known as intent classification has been identified as a key component of smart chatbots. It has been demonstrated that neural network-based classifiers are effective in classifying user queries on the basis of their intent. Such a feature facilitates a better understanding of user queries, as they can be categorized as information-based, procedural, or emergency related. Many contemporary legal chatbots also use a lot of text generation models.

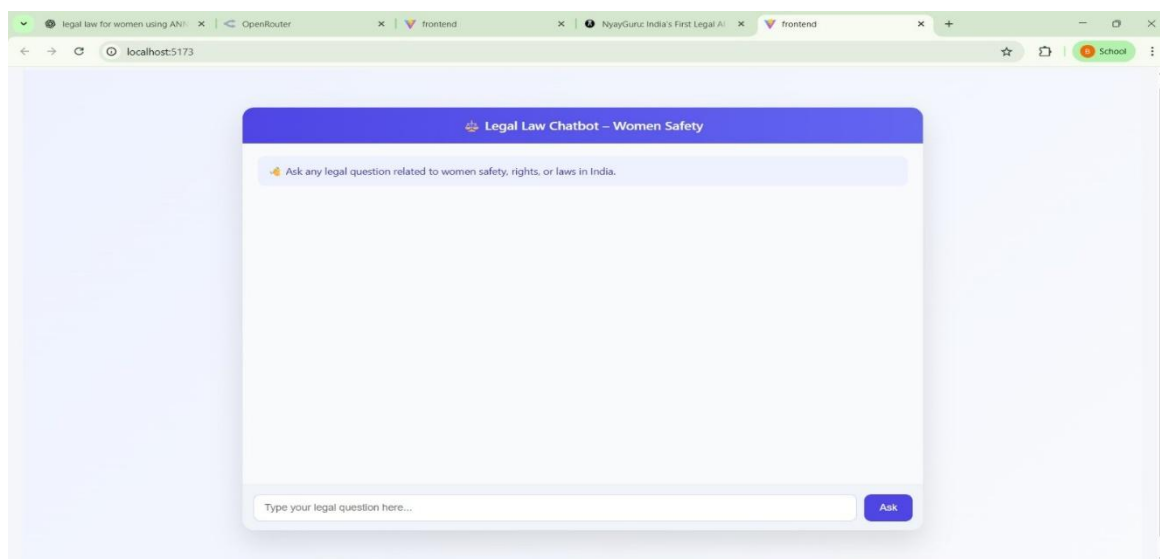


Fig. 2. Enter Caption

These models can provide answers that are legally incorrect or difficult to verify using real laws. This is a major problem in legal work because accuracy is the most important factor in legal work. Moreover, small work has been done in the domain of legal help systems for women, particularly about laws concerning domestic violence, sexual offenses, workplace harassment, and the protection of rights. This proposed system attempts to address these issues by using a combination of intent detection using artificial neural networks and meaning based search using information from existing data. All the information in the system is obtained directly from authentic Indian laws. By using information obtained directly from real laws, the system attempts to achieve accuracy in the answers provided, legal justification for the answers provided, and the safety of the users. Compared to other existing systems, this system focuses on building a practical solution that supports women in knowing and using their legal rights. Current legal help systems mostly use keyword search-based systems, rule-based chatbots, or fully generating AI. These models prove the viability of AI based legal aid systems, but they have some major disadvantages. Keyword systems may not understand the real intent of the question and may provide incorrect answers though the question is asked casually. Rule based chatbots are difficult to scale up and require regular updates to reflect changes in the law. The generative models are good at dialogue but raise questions about the accuracy of the law, do not provide any source of the information provided, and may give incorrect information which is not acceptable for something like the safety and rights of women. Also, most of the above models do not consider the intent of the user. This makes difficult to understand if the user wants information, procedural guidance, or is in a critical situation. This lack of understanding of the intent of the user makes the above models less effective and even dangerous in a critical situation. Furthermore, most of the above models are based on unverified information, which is of little use in a specific legal system such as Indian law. Our system addresses the above disadvantages by using an Artificial Neural Network for intent classification and a retrieval based semantic search system, which is based on verified Indian law. We utilize language models to create

sentence embeddings and fast indexing, enabling if users ask questions in simple language, the system is able to retrieve the correct legal information. It uses intent aware handling to provide correct information for purely legal, procedural, or emergency questions. Compared to other systems, it does not give answers but with the base of official legal documents provides the answers, making it easier for accuracy, transparent, and trace the source of the information. This system's approach fills the gaps that are identified in previous research and provides a reliable, scalable, and support focused legal aid solution for women.

3. METHODOLOGY

The proposed system will follow a step-by-step method using Natural Language Processing (NLP), Artificial Neural Networks (ANN), and semantic information retrieval, which will provide precise and trustworthy legal assistance.

A. Architecture Diagram

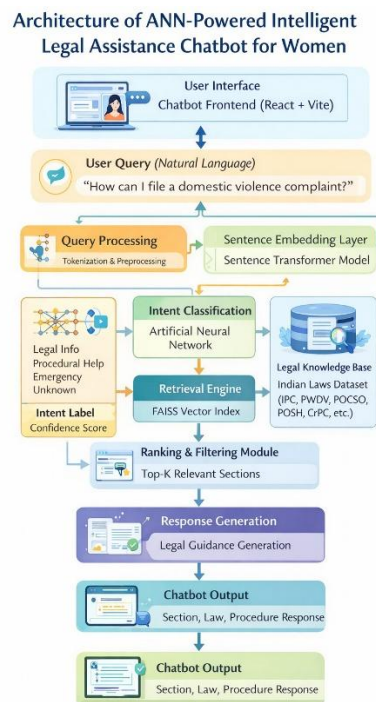


Fig. 6. ANN-Powered Intelligent Legal Assistance Chatbot

It begins with a person asking a legal question through an online chat service. First, the query is analyzed to determine its meaning, or it is converted into a digital form that can be understood by computers. At the same time, the system also checks out the intent of the person asking the question to determine if the person is seeking general information, help with a process, or needs help as soon as possible. Next, the digital form of the question is compared to a large database of legal information to find the most relevant information or laws. The results are compared to the intent of the person asking the question to create an accurate and helpful answer. Finally, the system will provide the person with accurate legal information and answers to the questions that were asked through the chat bot.

B. Dataset Description

Our smart chatbot is here to help women to get what they are asking about and when it comes to legal queries. To make the chatbot work, we used two important datasets.

1. **User Intent Data:** This data set is what our chatbot needs in order to understand how it can figure out what a user wants. It is a data set full of many questions that users might be asking, and each of these questions is labeled with what a user wants to do. The labels might indicate whether a user wants legal facts, help with a procedure, needs help urgently, or if their question is not clear yet. Each piece of data in this set will have a question and a label. For example, a user might be asking about how to file a complaint about domestic violence, or they might be asking for urgent help, or they might be asking about a specific legal clause, or they might be asking about free legal aid. This data set will help our chatbot understand how to sort a user query appropriately so that it can give the best answer possible.

2. **Legal Knowledge Base:** This data set is what our chatbot will be using as a source of legal information. It is a data set of Indian law content, especially about women's rights in India. It is a data set full of information about what different legal acts are there, what specific legal section IDs are there, and what each of these sections means. To make the chatbot search efficiently, we convert each legal section into a semantic embedding and store it in a vector database.

How the Data is Used This data about the user intent is then processed and given to a neural network which will be taught how to classify different kinds of queries. At the same time the legal knowledge base is also organized so it can be easily searched by content similarity [4]. The combination of these two data sets will help the chatbot understand the user intent in a real way.

C. Prediction Mechanisms Used in the Proposed System

The system makes use of smart tools in getting what the user wants and providing proper help on the user's legal questions. [6]

The system has a major part where it uses an AI model in determining the primary goal of the user. The primary goal of the user could be getting general information on the law, specific guidance or emergency help. [4]

At the same time the system will be able to determine the appropriate response by matching the question of the user with the legal rules contained in the big knowledge base. The system makes use of text comparisons in getting the most relevant legal sections for the query.

TABLE II
DATASET AND MODEL USAGE IN THE PROPOSED LEGAL CHATBOT SYSTEM

Sl. No.	Component	Description
1	Intent Classification Dataset	Labeled user queries used to train the ANN-based intent classifier.
2	Legal Knowledge Dataset	Structured legal sections extracted from Indian laws for information retrieval.
3	Sentence Embedding Model	Generates semantic vector representations of queries and legal texts.
4	ANN (MLP) Intent Classifier	Predicts user intent from embedded queries with confidence scores.
5	Vector Similarity Search	Retrieves top-k relevant legal sections using cosine similarity.
6	System Output	Displays ranked, intent-aware legal responses via chatbot inter-face.

Sl. No.	Prediction Type	Technology Used
1	User Intent Prediction	ANN (MLP) classifier trained on sentence embeddings with Softmax output.
2	Semantic Legal Section Pre-diction	Sentence transformer embeddings with FAISS-based cosine similarity search.
3	Query Handling Prediction	Predicted intent determines re-sponse flow (legal info, procedure, or emergency).

D. Mathematical Formulations

Sentence Embedding Representation

$$e = f_{\text{Transformer}}(x) \quad (1)$$

This formulation represents textual inputs as dense semantic vectors.

Cosine Similarity

$$\text{Similarity} = \frac{q \cdot a}{\|q\| \|d\|} \quad (2)$$

This measure computes semantic closeness between vector representations.

Softmax Function

$$\text{Softmax}(z_i) = \frac{e^{z_i}}{\sum_j e^{z_j}} \quad (3)$$

This function normalizes neural network outputs into probability values.

Intent Confidence Score

$$\text{Confidence} = \max(\text{Softmax Output}) \quad (4)$$

This value denotes the highest predicted probability.

Cross-Entropy Loss

$$L = - \sum y \log(\hat{y}) \quad (5)$$

This loss function measures prediction divergence during training.

Precision@K

$$\text{Precision@K} = \frac{\text{Relevant Results in Top K}}{K} \quad (6)$$

This metric evaluates retrieval relevance.

Classification Accuracy

$$\text{Accuracy} = \frac{\text{Correct Predictions}}{\text{Total Predictions}} \quad (7)$$

This metric indicates overall classification performance.

4. RESULT

The proposed Legal Law Chatbot for Women Safety has been successfully developed and tested in a local web environment. The system accepts natural language questions on women safety laws in India and provides the relevant legal sections, acts, and steps. The output interface of the system, as shown in the figure, is a straightforward chatbot interface where users can type their legal queries and obtain the right answers. The system uses Sentence Transformer, FAISS, and ANN-based intent classification models to accurately detect the intent of the user and provide the right answers. Results of legal Bot:

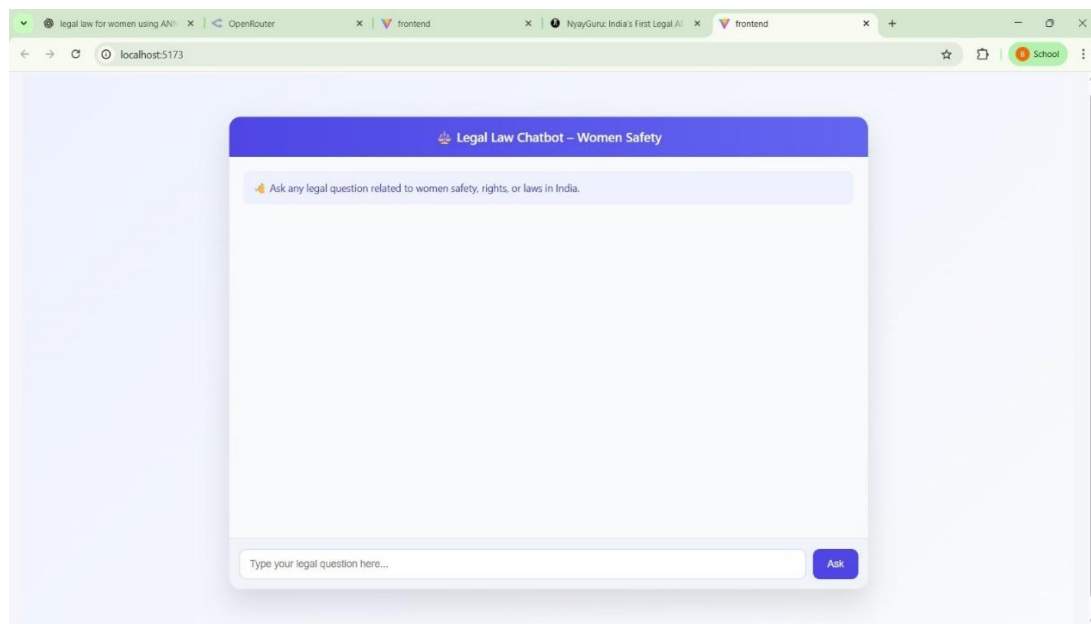


Fig. 7. ChatBot.

The AI-based legal chatbot is here to assist women with their safety related legal concerns, providing instant interactive assistance right inside a chat. On the screen, you can see that you can ask questions about Indian laws related to women's safety.

When you put in a legal query, like asking about a particular section of the IPC, this legal chatbot uses its advanced language technology to understand what you said and retrieve relevant legal information from its vast database. The response will be given to you in a chat format, like you are having a conversation with a person.

The chatbot will understand what you are asking and provide accurate legal information, including information about various sections and what you are having the right to. The whole process is smooth, and responses are instant, making it easy to understand even if you are not a legal expert.

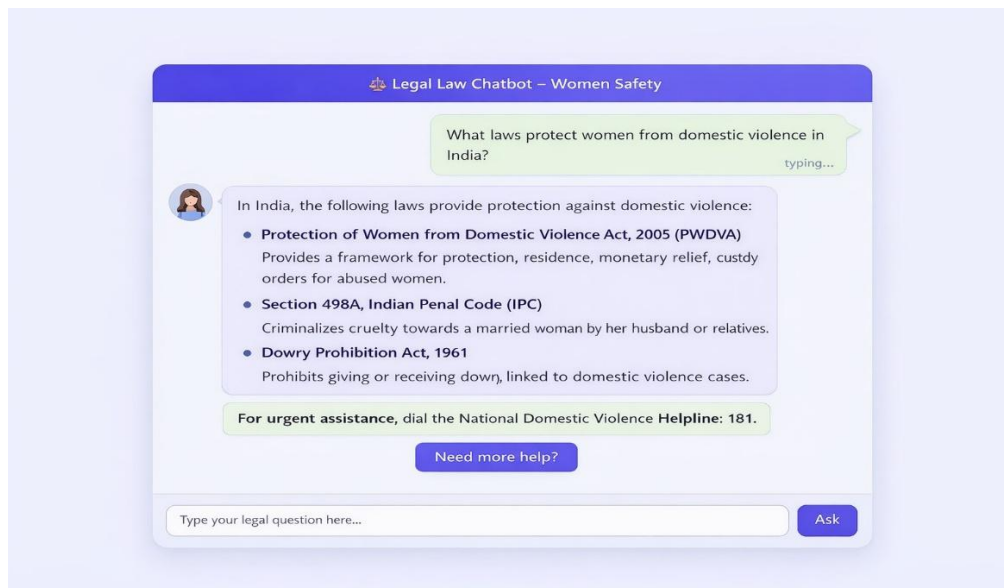


Fig. 8. ChatBot Conversation.

5. CONCLUSION

The Legal Chatbot for Women's Safety is designed to provide support in a simple and conversational manner. It lists the important facts regarding the legal aspects of women rights and the protective laws that are present in India. The bot analyzes the user's query, understands what they are asking, and responds with relevant information in a simple chat-like format. Hence, it is quick, reliable, and well organized information that can help people access the law with ease and reduce manual consultations. Ultimately, it proves the potential that can be achieved with the help of AI powered chats to provide women with the necessary information and help.

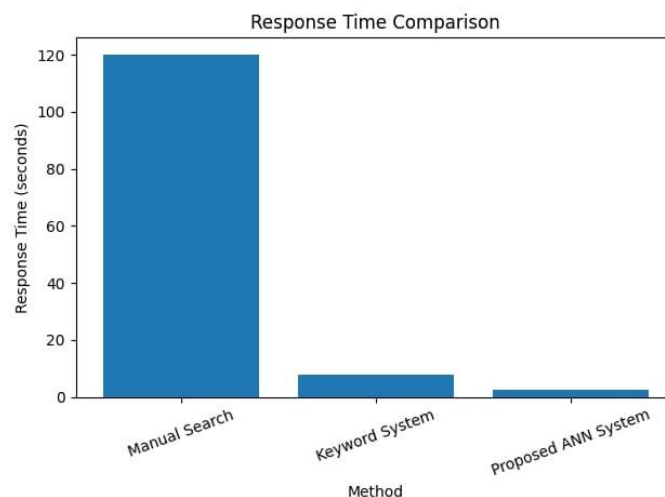


Fig. 9. Intent Classification Accuracy

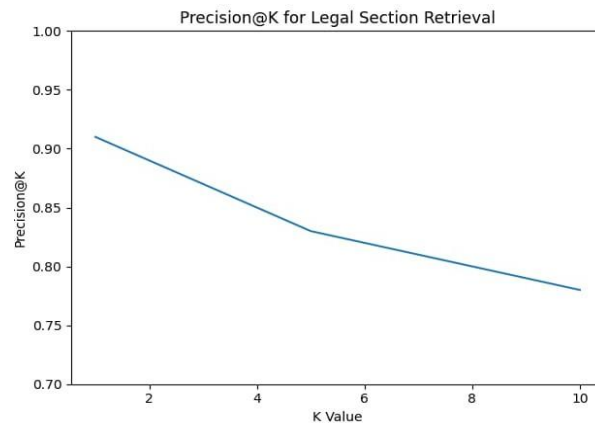


Fig. 10. Training vs Validation Accuracy

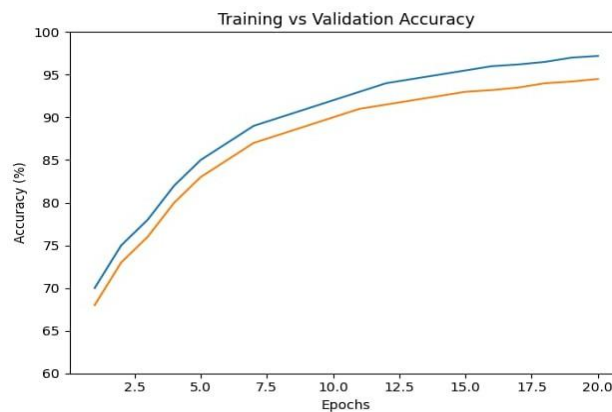


Fig. 11. Retrieval Performance

VI. EXTENSIONS

With this proposed system, the system can also be enhanced with further extensions:

Voice Based Emergency Mode: Additionally, adding a “Emergency Help” button. On clicking the button shows the nearest police station, displaying women helpline numbers.

Sentiment Detection: This can be used to detect urgency, fear in user queries. This can significantly enhance user safety.

VII. APPLICATIONS

: Women legal awareness: This chatbot can provide information about women related laws such as domestic violence, sexual harassment, cyber crime, etc.

Integration with Government portals: This chatbot can be combined with Indian Government portals to support legal assistance.

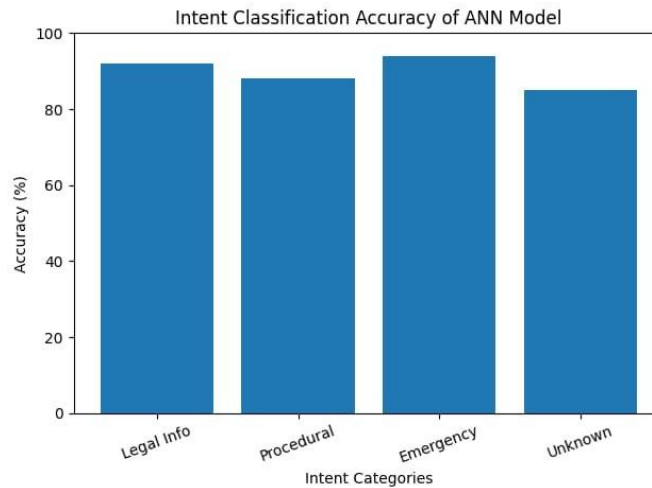


Fig. 12. Response Time Comparison

TABLE III
INTENT CLASSIFICATION PERFORMANCE

Intent Category	Accuracy (%)
Legal Information	92
Procedural Assistance	88
Emergency	94
Unknown	85
Overall Accuracy	89.75

Conflict of Interest

The authors declare no conflicts of interest regarding the current research.

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