

NyayaMitra: AI-Powered Legal Assistant for Case Analysis, RAG-Based Case Retrieval, and Fake News Detection

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Weekly Review Report

Weekly Review Report

Roll No: CS21B2045
Name: Telaprolu Lakshmi Srinivas

Week	Start Date - End Date	Work carried out during the week (with Your signature and Date)	Internal guide's comments with signature and Date
1	6/01/2025 - 12/01/2025	collected legal judgments through web scraping from Supreme & high courts <i>Ushini</i>	
2	13/01/2025 - 19/01/2025	continued scraping & also extracted the text & compared the different pdf extractor <i>Ushini</i>	<i>18</i>
3	20/01/2025 - 26/01/2025	classified judgments & orders implemented court specific techniques <i>Ushini</i>	
4	27/01/2025 - 02/02/2025	Done the preprocessing of the data for the model finetuning <i>Ushini</i>	
5	03/02/2025 - 09/02/2025	Finetuned Phi3 model using LoRA for legal chatbot <i>Ushini</i>	<i>18</i>
6	10/02/2025 - 16/02/2025	Completed chatbot training & created vector embedding to store in vector DB <i>Ushini</i>	
7	17/02/2025 - 23/02/2025	Implemented RAG & stored data in milvus vector DB. <i>Ushini</i>	
8	24/02/2025 - 02/03/2025	Developed chatbot & Pipeline for RAG & made report & prototype <i>Ushini</i>	<i>18</i>



Introduction

Background & Motivation

- Over 5 crore pending cases in Indian courts.
- Legal research is manual, slow, and inefficient.
- Judges & lawyers struggle to find relevant case precedences.
- Fake legal news misleads people and professionals.

Inspiration

- A Supreme Court case was delayed because a judge had to manually verify an old precedence.
- What if AI could instantly find and summarize legal references?

Scope of the Project

Key Features

- **Legal Chatbot** – Answers legal queries
- **Fake News Detection** – Flags misleading legal news.
- **Legal Document Summarization** – Summarizes lengthy judgments.
- **Precedence Search (RAG-Based)** – Finds relevant past cases instantly.

Why AI is Needed?

- Legal texts are complex and lengthy.
- No structured database for case laws.
- Manual case searches are slow and inefficient.
- Fake news spreads rapidly.

Literature Survey

Challenges in Legal Research:

- Traditional legal research is manual, time-consuming, and keyword-based, often leading to irrelevant or incomplete results (Chalkidis et al., 2021) [1].
- Western-trained NLP models like CaseLawBERT and ECHR-BERT struggle with Indian legal texts due to jurisdictional differences (Chalkidis et al., 2021) [1].

Advancements in Legal NLP:

- Legal NLP has improved case retrieval accuracy through domain-specific training (Wu et al., 2022) [2].

Legal Document Summarization: Legal texts are often long and use technical jargon, making it hard for non-experts to understand.

- AI-driven Extractive (TextRank, LexRank) and Abstractive (BART, T5, PEGASUS) summarization models help generate concise and comprehensible summaries (Shen et al., 2021) [3].

Literature Survey

Fake Legal News Detection: Fake legal news can mislead the public and influence judicial perception:

- Current fake news detection models rely on LSTMs, Transformers, and Knowledge Graphs (Zhou & Zafarani, 2020) [4].

NyayaMitra's Approach:

- Fine-tuning Phi-3 Mini on Indian Supreme Court & High Court judgments to improve contextual legal understanding.
- Using Retrieval-Augmented Generation (RAG) for context-aware legal case searches.
- Storing case data in Milvus vector database for enhanced legal reasoning and similarity-based retrieval (Wu et al., 2022) [2].
- Prompt-based fine-tuning of Phi-3 Mini for misinformation detection in the legal domain.

Key Contributions & Work Done

Data Collection & Preprocessing

- 200,847 legal documents scraped from Indian courts (Supreme Court & High Courts).
- Extracted structured text from PDFs using pymupdf (better accuracy than pdfplumber).
- Converted data into CSV format for model training.

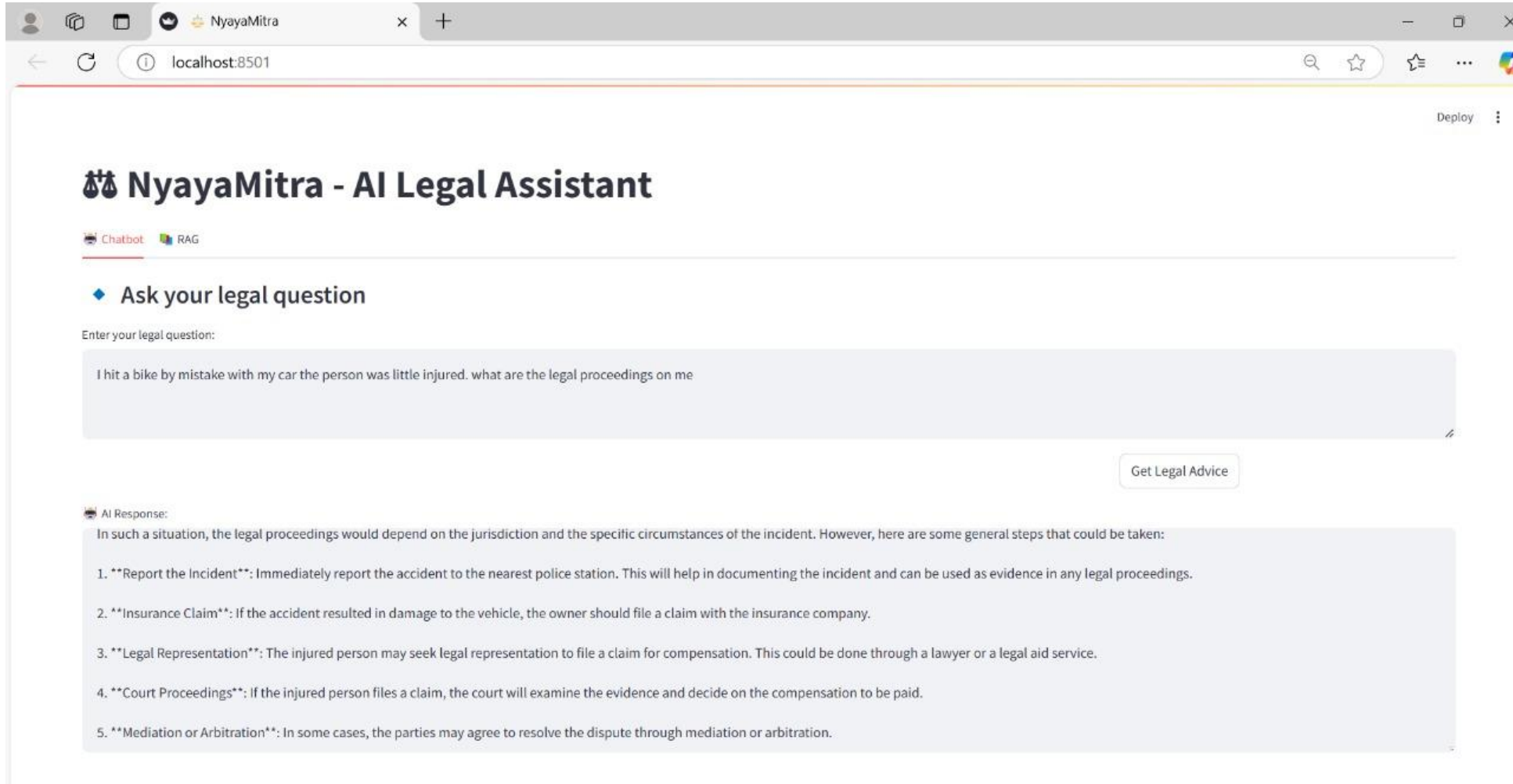
Legal Chatbot Development

- Fine-tuned Phi-3 Mini (4B parameters) using LoRA for efficient training.
- Used 200K+ legal cases, 30-hour training, 3 epochs for improved accuracy.
- Developed a working chatbot prototype for case insights & legal queries.

RAG-Based Legal Case Retrieval

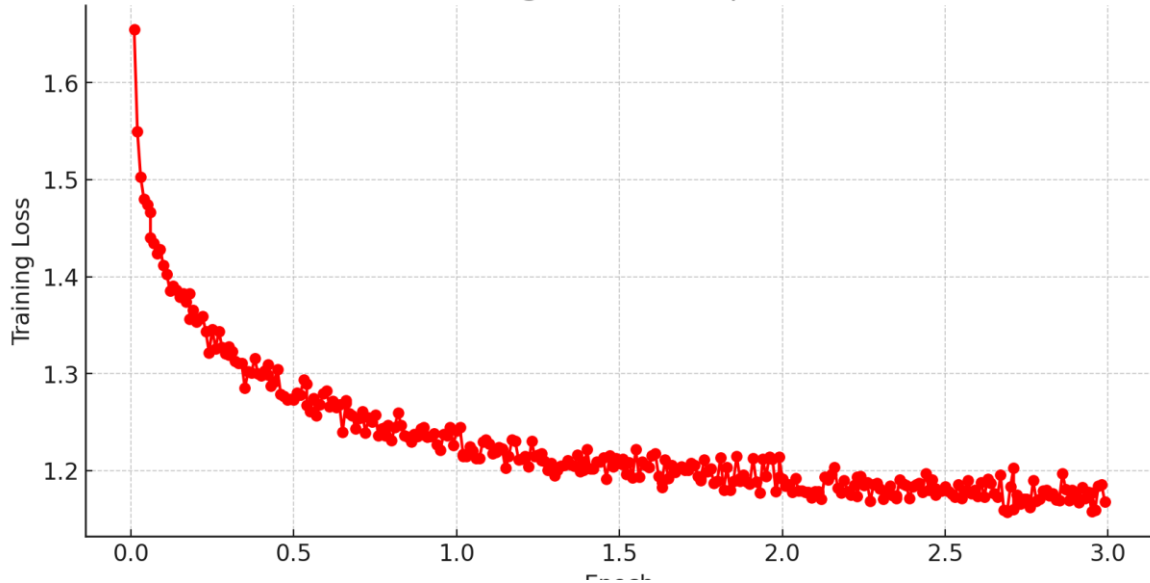
- Implemented RAG framework for case search, trained on 50,000 cases.
- Stored case law in Milvus vector database for vector-based retrieval.
- Improved accuracy & contextual understanding over traditional keyword search.

Prototype

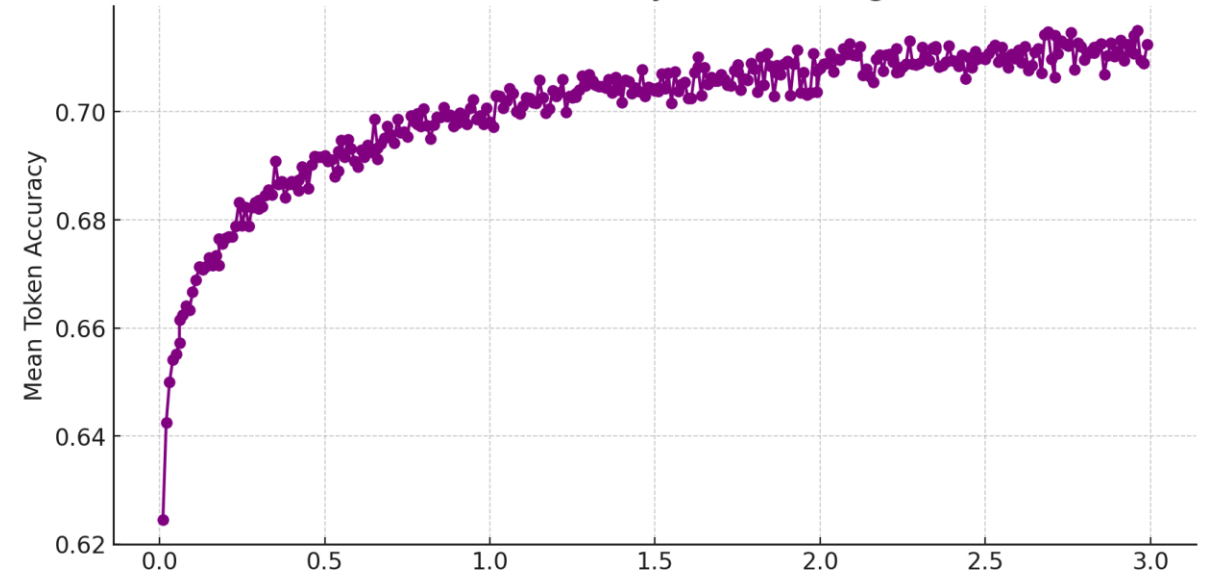


Results

Training Loss Over Epochs



Model Accuracy Over Training



Component	Evaluation Metric	Performance
Legal Chatbot	Response Accuracy (Human Evaluation)	85%
	Legal Relevance	High
RAG-Based Case Retrieval	Precision@5	80.4%
	Recall@5	84.5%

Table 3.3: Testing and Evaluation Metrics

Results

Metric	Score
Perplexity (PPL)	5.32
BLEU Score	47.8
ROUGE-1	52.4
ROUGE-2	39.2
Mean Token Accuracy	87.3%
Precision@5	80.4%
Recall@5	84.5%
Hit Rate@5	92.4%

Table 3.2: Evaluation Metrics for the Legal Chatbot and Retrieval System

Conclusion

- Revolutionizing Legal Research in India with AI-powered automation.
- 200,847 legal cases collected & processed from Supreme Court & High Courts.
- Developed RAG-based case retrieval system using Milvus, improving search accuracy.
- Trained Phi-3 Mini for legal summarization, making judgments concise & easy to understand.
- Built an AI-powered legal chatbot for quick case retrieval & law-related queries.
- Successful early testing – accurate case retrieval, effective summaries, and smooth chatbot responses.

Future Work

- Enhancing Case Retrieval
- Advancing Legal Summarization
- Developing Fake Legal News Detection
- Expanding Chatbot Capabilities
- Frontend Development & System Integration
- Final Testing & Deployment
- Agentic RAG System Integration

References

- **Chalkidis et al. (2021)** - "Legal NLP Models and their Role in Case Retrieval." *Journal of Artificial Intelligence & Law*.
- **Wu et al. (2022)** - "Vector-Based Legal Search Using FAISS & Milvus." *AI & Law Conference Proceedings*.
- **Shen et al. (2021)** - "Transformer-Based Summarization of Legal Texts." *Proceedings of NLP for Legal Documents*.
- **Zhou & Zafarani (2020)** - "Fake News Detection Using Graph-Based Models." *ACM Conference on Web Science*.



Thank You

Any Questions?

