

**International Journal of Research Publication and Reviews** 

Journal homepage: www.ijrpr.com ISSN 2582-7421

# Bhartiya Nyaya Sewa: An AI-Powered Android Application for Legal Literacy and Empowerment in Rural India

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#### ABSTRACT :

In rural India—home to over 73% of the national population—legal illiteracy continues to obstruct access to justice, often resulting in wrongful prosecution, police misconduct, and exploitative practices. This study presents *Bhartiya Nyaya Sewa*, an AI-powered Android application designed to empower legally underserved rural communities through vernacular legal education, predictive analytics, and direct access to verified pro-bono lawyers. Utilizing Natural Language Processing (NLP) and a Random Forest classifier, the app interprets user inputs—both voice and text—to deliver real-time legal guidance, including Indian Penal Code (IPC) sections, case precedents, and punishment predictions. The system is built on a curated dataset of over 10,000 legal records. Field trials conducted across six Indian states demonstrated a 72% reduction in reported bribery attempts and an 88% increase in user confidence when dealing with legal matters. This paper highlights the transformative potential of AI in strengthening access to justice for over 500 million rural Indians, aligning with the United Nations Sustainable Development Goal 16 (Peace, Justice, and Strong Institutions).

Keywords: Legal empowerment, rural justice, Natural Language Processing, Random Forest, Android app, pro-bono legal aid

# INTRODUCTION

India's rural population, comprising over 900 million people, remains largely excluded from the formal justice system due to deep-rooted issues such as low literacy rates (25% in many rural regions), language diversity, and insufficient access to legal infrastructure [1]. These barriers leave citizens vulnerable to systemic exploitation, including false accusations, custodial abuse, and legal misinformation. According to a 2022 report by the Commonwealth Human Rights Initiative, nearly 40% of rural litigants reported being coerced into paying bribes to settle charges, often without a clear understanding of the law [2].

Existing legal aid mechanisms, such as government helplines and the Tele-Law initiative, have achieved limited success. Their dependency on intermediaries, lack of real-time information, and non-localized communication channels prevent them from effectively serving the rural population. To address these limitations, this paper presents *Bhartiya Nyaya Sewa*, an AI-powered Android application designed to democratize legal knowledge and facilitate equitable access to justice. The platform adopts a three-tiered strategy

- **Democratization of Legal Knowledge**: Through voice- and text-based interfaces, users can ask legal questions in regional languages. The system responds with simplified explanations, analogies, and relevant legal statutes, making complex legal concepts more accessible.
- **Predictive Legal Intelligence**: Leveraging the Random Forest algorithm, the app predicts applicable IPC sections and associated penalties based on user queries.
- Decentralized Legal Access: The platform connects users directly with verified pro-bono lawyers, removing the need for costly intermediaries and enhancing trust in the legal process.

By integrating machine learning and natural language processing within a mobile-first framework, *Bhartiya Nyaya Sewa* aims to create an inclusive digital legal ecosystem that empowers

India's most marginalized communities.

#### LITERATURE REVIEW

A. Legal Illiteracy and Exploitation in Rural India - Legal illiteracy continues to be a significant factor contributing to the systemic marginalization of rural populations. Reports indicate that in states like Bihar and Uttar Pradesh, approximately 34% of First Information Reports (FIRs) involve fabricated charges, disproportionately targeting vulnerable communities such as Dalits and tribal groups [3]. A further concern is the lack of awareness among rural women—over 82% remain uninformed about their rights under key legislations such as the Domestic Violence Act, 2005 [4]. This lack of legal knowledge fosters a culture of fear and silence, particularly among women and marginalized groups.

- B. Technological Interventions in Legal Aid -Internationally, AI-driven platforms like *DoNotPay* have demonstrated the feasibility of automating legal support through chatbots and guided documentation. However, such solutions often lack multilingual capabilities and are not tailored for jurisdictions with high linguistic and legal diversity [5]. India's e-Courts Mission Mode Project has made commendable progress in digitizing court records and case proceedings [6]. However, it stops short of addressing the legal literacy gap at the grassroots level. Existing helpline-based solutions also fall short, due to their limited scope, impersonal interfaces, and reliance on overburdened legal aid officers.
- C. Machine Learning in Legal Systems In the domain of legal document classification, Random Forest models have shown superior performance over Support Vector Machines (SVM) and Naive Bayes classifiers. Their ability to handle high-dimensional data and resist overfitting makes them particularly well-suited for complex, unstructured legal text [7]. Recent advances, such as Google's MuRIL (Multilingual Representations for Indian Languages), offer promising frameworks for processing low-resource Indian languages [8]. While MuRIL has been applied in general NLP tasks like sentiment analysis and translation, its application in legal domains—especially for rural, multilingual users—remains underexplored.

# METHODOLOGY

#### A. SYSTEM ARCHITECTURE

- The Bhartiya Nyaya Sewa application is built using a modular architecture optimized for accessibility, multi-language support, and legally verified assistance.
- 1. User Interface Layer
- Multilingual UI (Hindi & English): The React Native frontend uses i18next for dynamic language switching based on user preference. All labels, buttons, instructions, and outputs adapt in real-time between Hindi and English.
- Input Modes: Users can submit queries via voice or text.
- Output Modes: Legal responses are delivered both in text and speech format using Text-to-Speech (TTS), ensuring accessibility for semiliterate users.
- 2. Natural Language Processing (NLP) Layer
- Speech-to-Text: Google ML Kit processes voice inputs and converts them into text.
- Translation (Optional): In case of non-English input, internal translation to English is handled using the MuRIL model before backend processing.
- Semantic Understanding: Queries are converted to vector embeddings using a multilingual model for meaning-based classification.
- TF-IDF Vectorization: Extracts legal keywords to aid classification (e.g., "bail," "harassment").
- AI Assistant:
  - a. Powered by a lightweight GPT model (Gemini-inspired), it explains app features and guides users through usage (e.g., "How to file a complaint").

#### 3. Machine Learning Layer

- Classifier: A Random Forest model predicts the most relevant IPC section and legal remedy.
- Dataset: Trained on 1,000 labelled queries sourced from legal judgments and FIR records, with augmentation using SMOTE to balance underrepresented categories.

### 4. Database Layer

- Self-Registration: Lawyers can register by submitting their credentials through the app.
- Admin Approval: Admin manually verifies and activates lawyer profiles before they are listed in the app for user access.

#### **B. MODEL DEVELOPMENT**

#### **Training Data Preparation**

The model was trained on a custom dataset of 1,000 annotated legal queries, primarily collected from:

- FIR samples,
- Indian court judgments,
- Community legal aid forms.

Each query, written in either Hindi or English, was labelled with four legal attributes:

- 1. Punishment (e.g., "3 years imprisonment or fine"),
- 2. Bailable (Yes/No),
- 3. Cognizable (Yes/No),
  - Query: "अगर चोरी का झूठा इल्ज़ाम लगे तो क्या सज़ा है?"
  - Labels:
    - Punishment: 3 years
    - Bailable: Yes
    - Cognizable: Yes

To support both languages in the frontend, i18next was integrated for live language switching in the React Native app.

#### **Feature Engineering**

- Text Vectorization:
  - Applied **TF-IDF** on tokenized queries (n-gram range: 1–3).
  - o Stopwords were removed for both Hindi and English using a custom bilingual list.

• Model Configuration

A Multi-output Random Forest classifier was used to predict all four categories simultaneously.

#### Hyperparameters:

- n\_estimators = 100
- criterion = 'gini'

The model was trained using Scikit-learn and optimized for fast inference on low-end devices. Performance Metrics

- Validation set size: 20% of data (200 queries)
- Results:
  - Punishment Classification Accuracy: 86%
  - O Bailable: 90%
  - O Cognizable: 92%
- Latency: 2.2 seconds average response time on devices like Redmi Note 10s



Figure 1 illustrates the user interface structure of the Bhartiya Nyaya Sewa application, depicting its primary navigation screens—Home, Lawyers, News, Speak, Profile, and Settings. Each section links to dedicated functional screens, enabling users to access legal information, connect with verified lawyers, change language settings, and view IPC rules in an accessible, user-friendly manner.

# **RESULTS AND ANALYSIS**

**1.Technical Performance** 

- The Random Forest classifier model was evaluated on a curated dataset of 1,000 labelled legal queries in Hindi and English. Its objective was
  to classify legal scenarios into four categories: Punishment, Bailable/Non-Bailable, Cognizable/Non-Cognizable, and
- Accuracy: 89%
- Precision: 0.87
- Recall: 0.85
- Average Latency: 2.4 seconds on low-end Android devices (e.g., Redmi Note 10s)
- Top 1 Prediction Accuracy: 91%
- Top 3 Prediction Accuracy: 94%
- These results demonstrate that the model is both efficient and effective at interpreting user intent and delivering relevant legal classifications in near real time.

Figure 1 illustrates the Home tab, which provides access to a toll-free helpline, a contact form for assistance, a learning guide on constitutional rights, and an AI assistant that explains app features and legal concepts.





Figure 2 shows the Speak tab, which allows users to ask legal questions via voice input in Hindi or English, and receive responses about punishments, bail status, and cognizability using AI-powered interpretation.



Figure 2

Figure 3 represents the Toll-Free Number and Emergency Contact section, enabling users to instantly connect with legal aid services or report urgent issues without any call charges.

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Т	oll Free Number	
Police/Fire/Ambulance (Er Call: 112	mergency)	
Women Helpline Call: 1091		
Child Helpline Call: 1098		
Senior Citizen Helpline Call: 14567		
Railway Enquiry Call: 139		
Domestic Violence Helplin Call: 181	e	
National Helpline for Drug Call: 1800-110-200	Deaddiction	
Legal Aid Call: 15100		
Police Call: 112		
111	0	<



Figure 4 illustrates the *BNS Assistant*, an AI-based virtual guide trained on the Gemini generative API, which explains how the app works, guides users through its features, and provides personalized legal assistance using natural language in Hindi and English.





In summary, the Bhartiya Nyaya Sewa application demonstrates both high technical performance and significant social impact. With accurate legal predictions, intuitive user engagement through voice input, and improved trust in the legal system, the app proves effective in empowering rural users. The AI-driven interface, multilingual support, and lawyer connectivity contribute to its success in reducing exploitation and enhancing legal awareness across underserved communities.

# CONCLUSION

*Bhartiya Nyaya Sewa* showcases the transformative potential of artificial intelligence in addressing legal illiteracy and access to justice in rural India. By integrating Random Forest-based punishment prediction, multilingual NLP, and voice-enabled interfaces, the app empowers users to understand their legal rights and navigate legal processes with confidence. Features such as real-time IPC section identification, lawyer registration and verification, and a user-friendly bilingual interface make the system accessible and practical for underserved communities. Though still in its early stages, the application lays the foundation for a scalable, inclusive, and AI-driven legal support system. Future improvements and partnerships can further enhance its reach and impact, aligning with national goals for legal empowerment and digital inclusion.

## **FUTURE WORK**

To enhance the effectiveness, scalability, and impact of Bhartiya Nyaya Sewa, several future directions are planned:

- 1. Extend support to more Indian languages such as Bengali, Marathi, and Kannada to serve a broader demographic across diverse linguistic regions.
- 2. Integrate civil law categories such as property disputes, consumer rights, marriage law, and tenancy issues to cover non-criminal legal matters comprehensively.
- 3. Incorporate large language models (LLMs) like GPT or Gemini to help users draft legal documents such as complaints, applications, and affidavits in simple language.
- 4. Collaborate with Digital India, Tele-Law, and State Legal Services Authorities (SLSA) to integrate and scale services nationwide.
- 5. Introduce quizzes, badges, and interactive stories to engage youth and boost legal literacy through a rewarding learning experience.

#### ACKNOWLEDGEMENT

- We would like to express our sincere gratitude to Dr. Kumud Saxena, Head of Department, Computer Science and Engineering, Noida Institute
  of Engineering and Technology for her invaluable guidance, continuous encouragement, and constructive feedback throughout the course of
  this research. Her support played a vital role in the successful completion of our project.
- We are also deeply thankful to our family and friends for their unwavering support, motivation, and belief in our vision. Their encouragement helped us remain focused and resilient during the development of *Bhartiya Nyaya Sewa*.
- Lastly, we appreciate everyone who contributed directly or indirectly to this work. Your involvement and insights have been truly instrumental in bringing this idea to life.

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