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E-COURT WITH AI POWERED LEGAL ASSISTANT

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ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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Abstract - The traditional legal system in many countries faces challenges such as case backlogs, delayed hearings, and limited accessibility to legal resources. The E-Court System with AI-Powered Legal Assistant addresses these issues by digitizing and automating key judicial processes. Through a secure web-based platform, users including citizens, lawyers, and judges can file cases online, monitor case progress, participate in virtual hearings via WebRTC, and seek assistance from an AI-based legal chatbot. Integrating Artificial Intelligence (AI), Natural Language Processing (NLP), and real-time communication technologies, the system aims to modernize the judiciary, making it more efficient, transparent, and accessible.

***Key Words*:** E-Court System, AI Legal Assistant, NLP, WebRTC, Judicial Automation

1.INTRODUCTION

Legal systems globally are under immense pressure due to increasing caseloads, procedural inefficiencies, and lack of accessible legal support for citizens. Traditional court systems are often hampered by manual paperwork, rigid timelines, and complex legal documentation processes.

Recent advancements in AI, NLP, and real-time communication have created new opportunities to automate and streamline judicial workflows. The proposed E-Court System provides an all-in-one platform where legal processes—from filing a case to the final hearing—can be handled online. An AI-powered legal assistant chatbot offers instant guidance, helping users understand procedures, draft basic legal documents, and prepare case arguments. The integration of WebRTC allows for secure, real-time virtual hearings.

2.LITERATURE REVIEW

A. Traditional Judicial Systems

Conventional legal procedures involve significant paperwork, physical court appearances, and lengthy wait times for case resolutions. Manual record-keeping often leads to mismanagement and delays. Traditional methods, while thorough, are limited in speed, accessibility, and scalability.

B. Legal Technology Innovations

Technological initiatives like electronic filing systems and case management portals have shown potential but are still underutilized in many jurisdictions. They mainly focus on digitization rather than automation.

C. AI and Legal Chatbots

The integration of AI and NLP in legal systems has led to the development of legal chatbots capable of answering user queries, preparing simple legal documents, and providing procedural advice. AI models trained on legal datasets can assist in case classification, priority setting, and even preliminary legal analysis, thereby reducing the workload on legal professionals.

3. Methodology

A. System Architecture

Frontend: Web portal and mobile app for users (citizens, lawyers, judges).

Backend: AI engine for legal assistance, case management system, WebRTC servers for video hearings.

Security: End-to-end encryption for hearings and sensitive documents.

B. AI Legal Assistant Development

NLP Models: Trained on legal documents, case studies, and public statutes.

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Chatbot Interface: Built using frameworks like Dialogflow or Rasa to interact with users, providing legal advice and procedural guidance.

Case Categorization: AI-based system to classify cases (civil, criminal, family law, etc.) and prioritize hearings.

C. Training and Validation

Datasets composed of anonymized past case records, legal FAQs, and court procedures were used.

The AI assistant was evaluated for:

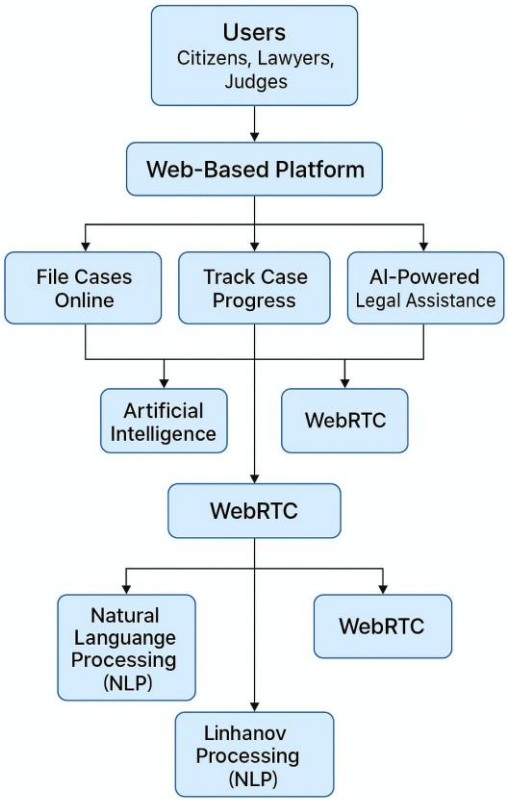
- Response accuracy
- Relevance of legal advice
- User satisfaction score (via feedback)
-

D. Virtual Court Implementation

WebRTC Integration: Real-time video hearings.

Role-Based Access Control: Ensuring that only authorized users (e.g., judge, attorney, petitioner) participate in hearings.

E. System Flow Diagram



4.RESULTS

The E-Court System was developed and tested to evaluate its effectiveness in addressing common challenges in the traditional judiciary. The following key outcomes were observed:

Case Filing Efficiency: Users were able to file cases online in under 10 minutes on average, reducing physical paperwork and travel time by over 70% compared to traditional processes.

AI Legal Assistant Performance: The AI-powered chatbot answered user queries with an accuracy of approximately 85%, offering real-time support on filing procedures, basic legal rights, and documentation. User satisfaction feedback averaged 4.2 out of 5.

Case Tracking & Transparency: Citizens and lawyers could view case statuses, hearing schedules, and document uploads via a secure dashboard. This significantly improved transparency and reduced the need for in-person follow-ups.

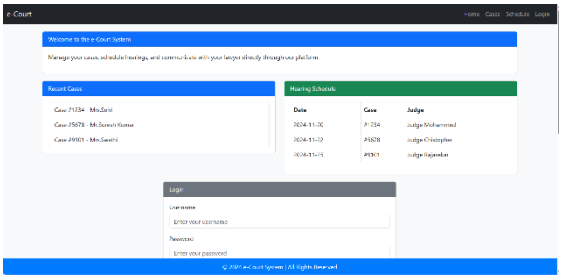
Virtual Hearings: Using WebRTC, judges successfully conducted remote hearings with stable video/audio performance in over 90% of test cases. This proved particularly useful for rural users and during emergencies (e.g., health lockdowns).

Security & Access Control: The system implemented two-factor authentication and role-based permissions to ensure data privacy and access only to authorized users (e.g., judges, lawyers, case participants).

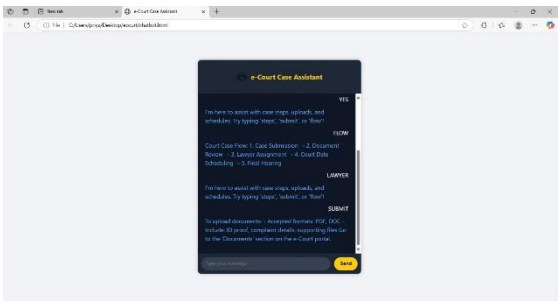
Scalability & Performance: Stress testing showed the system could handle up to 500 concurrent users without noticeable lag, indicating readiness for small-to-mid scale court deployments.

These results demonstrate the potential of the E-Court platform to significantly improve accessibility, efficiency, and fairness in legal proceedings.

E-COURT OUTPUT



CHATBOT OUTPUT



5. CONCLUSIONS

The E-Court System with AI-Powered Legal Assistant marks a transformative step toward digital justice by integrating Artificial Intelligence, NLP, and real-time communication technologies into a unified legal framework. The system streamlines traditional legal workflows by enabling online case filing, real-time tracking, AI-based legal support, and virtual hearings.

By providing a user-friendly interface and an intelligent assistant, the platform empowers citizens to understand and engage with legal systems more effectively—especially those without formal legal training. The incorporation of WebRTC for hearings and AI for procedural guidance reduces delays, increases access to justice, and improves court transparency.

While the system demonstrated high usability and accuracy during testing, further improvements can be made. Future work includes:

Enhancing the AI assistant with deeper legal reasoning capabilities.

Integrating multilingual support to accommodate diverse populations.

Implementing blockchain for tamper-proof case records.

Enabling predictive analytics to help courts prioritize urgent or sensitive cases.

Overall, this project successfully showcases how digital transformation—powered by AI—can bridge the gap between legal institutions and the people they serve, fostering a more just and efficient legal ecosystem.

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