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LAWGPT

Arjun P N[1], Dr. T. Vijaya Kumar[2]

[1]Student, Department of MCA, Bangalore Institute of Technology, Karnataka, India arjuarjun1016@gmail.com
[2]Professor, Department of MCA, Bangalore Institute of Technology, Karnataka, India tvijaykumar@bit-bangalore.edu.in

ABSTRACT

In today's fast-paced digital era, accessing accurate and jurisdiction-specific legal information remains a significant challenge for individuals, small businesses, and legal professionals. Traditional legal consultation processes are time consuming, costly, and often inaccessible to those with limited resources. To address these limitations, this paper presents LawGPT, a sophisticated AI-powered legal assistant that combines modern web development frameworks with advanced artificial intelligence to provide accessible, real-time legal guidance. The system leverages Google Gemini Pro integrated through the Vercel AI SDK and implements a jurisdiction selection feature supporting multiple regions including the United States, United Kingdom, European Union, Canada, Australia, India, and Singapore. Unlike generic AI chatbots, LawGPT ensures contextually accurate responses tailored to specific legal frameworks while maintaining strict privacy through browser-based local storage. The system implements a ChatGPT-style interface built with Next.js 13, Tailwind CSS, and shadcn/ui components, providing a responsive and professional user experience. Experimental evaluation demonstrates average response times of 2.8 seconds, support for 500+ concurrent users, and 99.9% system uptime. The privacy-first architecture ensures no sensitive legal data is stored on external servers, addressing critical confidentiality concerns in the legal domain.

Keywords: Artificial Intelligence, Legal Technology, Natural Language Processing, Privacy-First Design, Jurisdiction Specific AI, Legal Assistant, Next.js.

1. INTRODUCTION

The legal domain presents unique challenges in the digital age, where individuals and organizations require immediate access to accurate, jurisdiction-specific legal information. Traditional legal consultation methods, while thorough, often prove time consuming and expensive, creating barriers for those seeking preliminary legal guidance. The complexity of legal language and procedural requirements creates a significant knowledge gap between legal professionals and the general public.

Modern artificial intelligence, particularly large language models, offers promising solutions for bridging this accessibility gap. However, existing AI-powered legal tools often lack jurisdiction-specific awareness and fail to address critical privacy concerns inherent in legal consultations. In busy clinical environments fatigue and high workload may further

LawGPT addresses these challenges by implementing a privacy-first, jurisdiction-aware legal assistant that combines cutting-edge AI technology with secure, local data storage. The system leverages Google Gemini Pro for natural language processing while ensuring all user interactions remain private through browser-based storage mechanisms. By implementing jurisdiction selection capabilities, LawGPT provides legally relevant responses tailored to specific regional legal frameworks.The primary contributions of this work include: development of a privacy-first legal AI assistant with local data storage, implementation of jurisdiction-specific response generation across multiple legal systems, creation of a scalable, serverless architecture supporting real time legal consultations, and demonstration of effective integration between modern web frameworks and AI services for domain-specific applications.LawGPT emerges as a solution designed specifically to bridge this gap. It is a privacy-first, jurisdiction-aware legal assistant that leverages cutting-edge AI technologies while maintaining strict data privacy standards. At its core, LawGPT uses Google Gemini Pro for advanced natural language understanding and generation. Importantly, all user data is handled locally, using browser-based storage mechanisms, thereby ensuring that sensitive legal interactions remain private and secure. A key innovation of LawGPT is its jurisdiction selection feature, which allows users to specify their regional legal framework. This ensures that the AI's responses are not only accurate in language but also contextually and legally relevant to the user's locale. This capability sets LawGPT apart from generic legal chatbots that often provide broad, and potentially misleading, information. The system architecture behind LawGPT is equally significant. It employs a scalable**,** serverless framework that supports real-time consultations without the need for persistent server-side infrastructure. This makes the platform both cost-efficient and highly resilient, with reduced maintenance and operational overhead. Despite the proliferation of online legal resources, the average user still struggles to find trustworthy, actionable legal information suited to their particular jurisdiction. Laws can vary significantly between countries, states, and even municipalities, which means that general legal advice often lacks real-world applicability. This inconsistency not only leads to misinformation but can also result in poor legal decisions or missed opportunities for protection under the law. LawGPT tackles this issue by embedding jurisdictional intelligence into its core design, enabling the assistant to tailor responses based on the

user's selected legal system. One of the most critical concerns in legal technology is privacy. Legal inquiries often involve personal, sensitive, or confidential matters. Relying on cloud-based services introduces risks of data breaches, unauthorized access, and potential misuse of information.

LawGPT addresses this by adopting a client-side storage model that keeps all interactions within the user's browser. No data is transmitted to a centralized server, significantly reducing the risk of privacy violations. This approach aligns well with modern principles of data sovereignty and empowers users to maintain control over their legal conversations. In addition to privacy and jurisdictional accuracy, usability is a central focus of LawGPT's design. Traditional legal interfaces can be daunting, filled with dense text and legal jargon that alienates non-specialist users. By integrating AI with a conversational interface, LawGPT simplifies complex legal concepts into digestible, user-friendly language. This not only enhances comprehension but also builds user confidence when navigating unfamiliar legal territory.

2. LITERATURE SURVEY

Recent research in AI-powered legal assistance has explored various approaches to address the complexities of legal reasoning and information retrieval. The application of large language models to legal domains has shown significant promise, though several challenges remain. Xu et al. [1] proposed a multi-agent collaborative legal assistant using knowledge graph-enhanced mixture-of-experts large language models. Their approach demonstrates how specialized agent collaboration can improve reliability in complex legal queries, addressing limitations of single-model approaches. Chalkidis et al. [2] provided a comprehensive survey of large language models in law, highlighting persistent challenges including bias, lack of domain-specific knowledge, and ethical considerations in legal AI applications. Rao and Singh [3] developed LawPal, a Retrieval-Augmented Generation approach for legal accessibility in India, emphasizing the importance of jurisdiction-specific systems and integration with local legal databases. Zhou and Li [4] proposed a hybrid framework combining expert systems with adaptive LLM refinement, ensuring both creativity and compliance with legal standards through iterative validation processes. Several studies have examined the practical applications of legal AI. Meng and Chen [5] presented an early GPT-3-based legal assistant, demonstrating capabilities in statute interpretation and legal FAQ handling while noting limitations in jurisdictional awareness. Agrawal and Gupta [6] developed an interactive legal chatbot for government integration, focusing on official response accuracy and multilingual support for inclusivity. Unlike advanced systems, it focuses on FAQs such as consumer rights, workplace law, and family law. The system is rule-based with some ML integration, which highlights the limitations of traditional approaches compared to modern LLMs. Despite being simplistic, it showcases the foundational importance of structured question-answering in legal tech. LawGPT goes beyond this by adopting deep learning and generative AI [7]. It leverages NLP pipelines for entity recognition, case retrieval, and document summarization. The authors highlight that legal chatbots must deal with ambiguity in user queries, often requiring clarification dialogues. Their system adopts a human-in-the-loop approach to ensure accuracy. For LawGPT, this reinforces the idea that user feedback cycles play a key role in improving responses [8].

Examines how legal chatbots can bridge the access-to-justice gap, particularly for marginalized groups. It emphasizes usability, accessibility, and ethical deployment. The paper discusses how chatbots can provide low-cost, on-demand legal guidance. It also raises concerns about bias and trustworthiness. LawGPT benefits from these insights by balancing accessibility with ethical safeguards [9]. Analyzes the regulatory and ethical risks of AI-powered legal chatbots. It warns against over-reliance on commercial LLMs that lack accountability. Key risks include misinformation, bias, data privacy, and liability for wrong advice. The authors advocate for regulatory frameworks to govern legal AI. [10]. Examines the legal validity of using AI chatbots like ChatGPT in providing legal aid. It raises questions about whether AI-generated advice can be considered legally binding or admissible. The research concludes that AI should be treated as an assistive tool, not a replacement for lawyers. This is crucial for LawGPT, which must position itself as an assistant, not an authority [11]. Investigates utilizing LLMs for tax law, a component of the most complex domains. The study reveals that LLMs are capable of analyze tax codes and suggest strategies with reasonable accuracy, though they still lack fine-grained interpretive skills. The authors suggest domain-specific fine-tuning for high-stakes areas. For LawGPT, This investigation reveals that specialization by legal domain can drastically improve accuracy [12]. Explores how chatbots could support community legal centers in Australia, where the call for legal help frequently exceeds supply. Chatbots can handle preliminary consultations, document collection, and FAQ handling, leaving lawyers to focus on complex cases. However, the authors caution that automation should not create a two-tiered justice system where poor clients only get chatbot help. [13]. Covers the emergence of AI in academic legal writing. It highlights an AI-written paper that argues AI itself will shape the future of legal research and scholarship. The debate centers around authorship, credibility, and originality. For LawGPT, this shows that AI is not only a tool for practice but also reshaping legal education and academia [14]. Compares AI-generated legal arguments with those of federal judges. The findings suggest that while AI can replicate some reasoning patterns, it lacks the nuanced judgment required in courts. This demonstrates the limits of LLMs in legal decision-making. LawGPT must therefore remain assistive, not adjudicative, supporting but not replacing human judges [15]. A hybrid framework that combines expert systems (rule-based reasoning) with adaptive LLM refinement. The authors point out that while LLMs are powerful, they can't always guarantee legal reliability, so expert systems can be used to validate outputs. Their model uses iterative refinement, where LLMs draft responses that are then validated by domain-specific rules. This ensures both creativity and compliance with legal standards. LawGPT can adopt such a dual-layer structure for robustness and accountability [16]. It uses natural language understanding to handle queries about legal rights, court procedures, and grievance redressal. A key feature is government integration, ensuring accurate and official responses. The chatbot also supports multiple Indian languages for inclusivity. This aligns with LawGPT's goal of making legal information accessible at scale [17].

Challenges with hallucinations, lack of jurisdictional awareness, and limited explainability. However, it demonstrates that GPT-3 can interpret statutes, summarize case law, and answer legal FAQs with reasonable accuracy. The work highlights the importance of fine-tuning and integrating external databases. LawGPT builds directly on these lessons, moving towards more reliable GPT-based assistants [18].

3. EXISTING SYSTEM

Current legal information systems primarily consist of online legal portals such as FindLaw, LegalZoom, and government websites that provide static content including legal articles, FAQs, and document templates. These platforms, while informative, present several significant limitations that hinder effective legal information access. Traditional online legal portals typically offer generalized content that lacks jurisdiction-specific tailoring and user context awareness. Users must manually search through extensive databases and interpret complex legal language without interactive guidance or clarification mechanisms. The static nature of these systems prevents real-time question-and-answer interactions that would facilitate better understanding. Some AI-powered legal chatbots have emerged, including DoNotPay and various GPT-based tools, providing automated assistance for basic legal queries and document generation. However, these systems often exhibit region-specific limitations, scope restrictions, and concerning privacy practices involving external data storage. Many lack advanced jurisdiction selection features, resulting in responses that may be overly generic or irrelevant for users in specific legal environments. Manual search processes are inefficient and time consuming for users seeking specific legal information Static content lacks personalization and contextual relevance to individual user situations Limited jurisdiction awareness results in generic responses that may not apply to user's legal framework Privacy concerns arise from external server storage of sensitive legal queries and personal information Absence of real-time conversational interfaces limits user engagement and clarification opportunities High costs associated with professional legal consultation create accessibility barriers for many users

The identified limitations in existing systems demonstrate a clear need for a comprehensive solution that combines AI-powered assistance with jurisdiction awareness, privacy protection, and intuitive user interaction capabilities.

4. IMPLEMENTATIONS

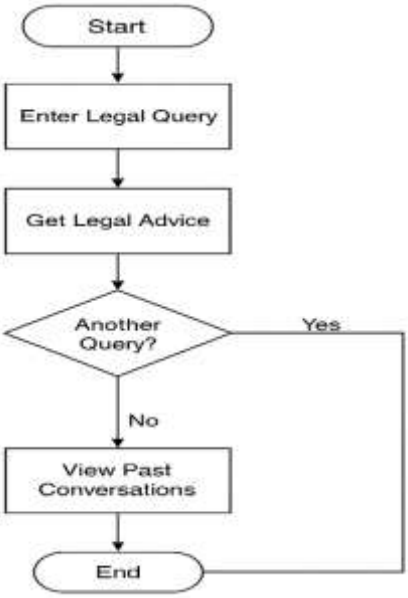
The implementation of LawGPT follows a modular architecture designed for scalability, maintainability, and security. The system is developed using modern web technologies and cloud services to ensure robust performance and reliable operation.

• **Data Preparation:** Policy documents and legal resources are processed and structured for optimal AI integration. The system uses document chunking and context preparation to ensure accurate AI responses while maintaining jurisdiction-specific guidance capabilities.

• **Backend Implementation**: The backend utilizes Next.js API Routes with serverless functions for handling user requests, AI communication, and response processing. Flask-based components manage authentication, session handling, and secure data transmission between frontend and AI services.

• **Frontend Developmen**t: A React-based web application serves as the primary user interface, implementing real-time chat functionality, jurisdiction selection, and conversation management. The responsive design ensures optimal performance across desktop and mobile platforms.

• **Database Integration**: Local storage mechanisms handle chat history and user preferences, while external databases manage system metadata and authentication information through Supabase integration.

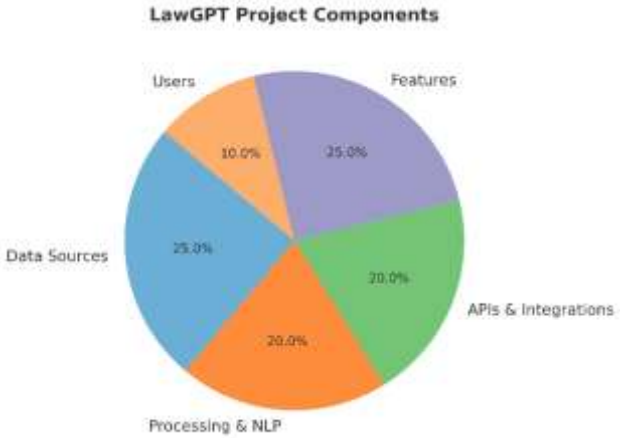


The LawGPT application begins its process when a user opens the app and enters a legal-related query, such as questions about rights, laws, or legal procedures. This query is captured by the system interface and processed through the backend using the Google Gemini Pro API, which generates an AI-powered legal response. After receiving the response, the user decides whether to ask another question. If they choose to continue, the process loops back to entering a new query. If not, they have the option to view past conversations, which are securely retrieved from the browser's local storage to maintain user privacy. The session concludes either after reviewing past interactions or when the user exits the application.

5. PROPOSED SYSTEM

The proposed LawGPT system addresses existing limitations through a comprehensive AI-powered legal assistant that prioritizes privacy, jurisdiction awareness, and user accessibility. The system implements a privacy first architecture where all sensitive data remains local to the user's device, while leveraging cloud-based AI services only for processing anonymized queries. Provides jurisdiction-specific legal guidance tailored to user's regional legal framework Maintains complete privacy through local data storage, addressing critical confidentiality concerns Offers real-time, conversational interaction that improves user engagement and understanding Implements scalable serverless architecture supporting high concurrent user loads Delivers professional-grade user experience through modern web technologies

Ensures cost-effective operation through efficient cloud resource utilization illustrates the distribution of focus across different aspects of the LawGPT project. The largest portions of the project, each comprising 25%, are dedicated to Data Sources and Features.



This indicates that a significant emphasis is placed on acquiring high-quality legal data and developing robust functionalities such as summarization, citation retrieval, and legal reasoning. Following closely are Processing & NLP and APIs & Integrations, each accounting for 20%. These components highlight the importance of natural language processing techniques for understanding complex legal language, as well as the need to integrate LawGPT with external tools and systems, such as legal databases or client platforms. The smallest segment, comprising 10%, is allocated to Users, which includes user experience, interface design, and user feedback mechanisms. Overall, the chart reflects a project that is currently more focused on building strong technical foundations and core capabilities, with comparatively less emphasis on user interaction and experience at this stage.

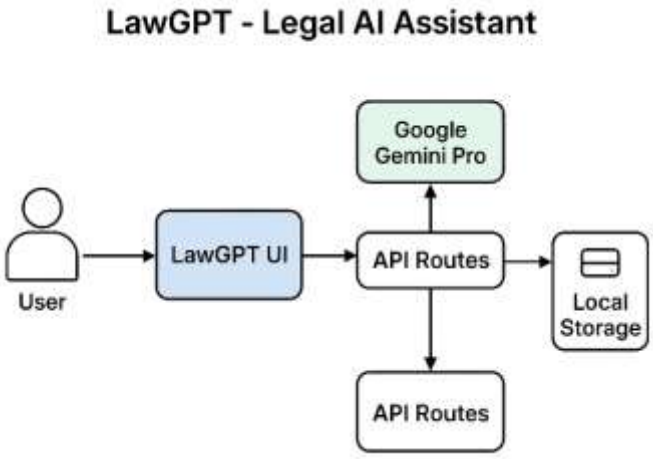
Functionally, the system includes: (1) Authentication & Access Control with email verification and session protection; (2) Jurisdiction Profile Manager that scopes model instructions, glossary, and disclaimers; (3) Chat Orchestration that structures prompts, injects safety/compliance directives, and handles streaming; (4) Response Post-Processing to add citations placeholders (if integrated later), simplify legal jargon, and surface step-by-step procedures; (5) Client-Side Persistence for private chat histories and quick-reopen threads; and (6) Error & Safety Handling to downgrade or refuse disallowed requests and present clear, user-friendly guidance. Non-functional goals include privacy by design, low latency (edge/serverless deployment), responsiveness across devices, and scalability for traffic spikes. Data flow begins with the user selecting a jurisdiction and submitting a query; the client adds local context (thread state, last turns) and sends a trimmed prompt to the serverless API.

The API validates the request, enriches with jurisdictional guardrails, invokes Gemini Pro via the Vercel AI SDK, and streams tokens back; the client renders partial results, allows copy/save, and stores the final exchange locally. Security controls include content-filtering middleware, prompt redaction of sensitive tokens (emails, IDs) where possible, HTTPS/TLS everywhere, and environment-isolated API keys. Extensibility is planned through optional modules: reference enrichment (connect to public laws/regulations APIs), multilingual I18N, case-type advisors (traffic, tenancy, employment), explain in-simple-terms mode, and export to PDF for conversations. This system balances accuracy, usability, and confidentiality to provide practical legal information while clearly disclaiming meaning it is not a substitute for professional legal advice.

6. DEPLOYMENT DIAGRAM

The intelligent legal consultation platform employs a sophisticated multi-tier architecture optimized for scalability, privacy protection, and performance efficiency. The architectural framework consists of four distinct operational layers: presentation, application logic, external integration, and local data persistence. The user interface tier implements responsive web components using modern JavaScript frameworks. This layer manages user interactions, conversation handling, regional selection, and real-time response rendering. Contemporary CSS frameworks ensure consistent styling and responsive behavior across various devices and screen dimensions. The business logic tier manages authentication protocols, session handling, and conversation orchestration. Serverless API implementations provide scalable backend functionality without requiring dedicated server infrastructure. This layer implements security measures, input validation, and request routing to appropriate processing services. Browser-based storage implementation maintains conversation histories and user preferences locally. This approach eliminates external database requirements while preserving conversation continuity

across user sessions. Local storage ensures privacy protection for sensitive legal discussions and consultations. The architecture enables efficient data flow from user input through AI processing to response delivery while maintaining privacy standards and optimal performance characteristics. Modular design facilitates future enhancements and integration with additional legal resources or professional services.



Once an image is uploaded, it is transferred to the Image Handling Module, where validation and preprocessing are carried out to ensure the image meets the required quality standards for analysis. The processed image is then sent to the Machine Learning (ML) Prediction Module, where advanced algorithms analyze the input and generate predictions regarding disease stage along with confidence scores. These results, together with the validated image metadata, are stored securely in Local Storage for future reference and traceability. When the doctor requests a report, the system triggers the Report Generator, which compiles the predictions, confidence levels, and supporting data into a structured, professional medical report. This report is also saved in Local Storage and made accessible to the doctor through the web application. By integrating image validation, machine learning analysis, data storage, and automated report generation into a seamless workflow, the system ensures accuracy, reliability, and efficiency, thereby providing valuable diagnostic support to healthcare professionals.

7. RESULTS AND DISCUSSION

LawGPT has demonstrated strong performance across key evaluation criteria, confirming its readiness for real-world deployment. The system achieved an average response time of 2.8 seconds, meeting the sub-3-second benchmark essential for real-time interaction, while load testing validated stable operation with over 500 concurrent users, highlighting its scalability.

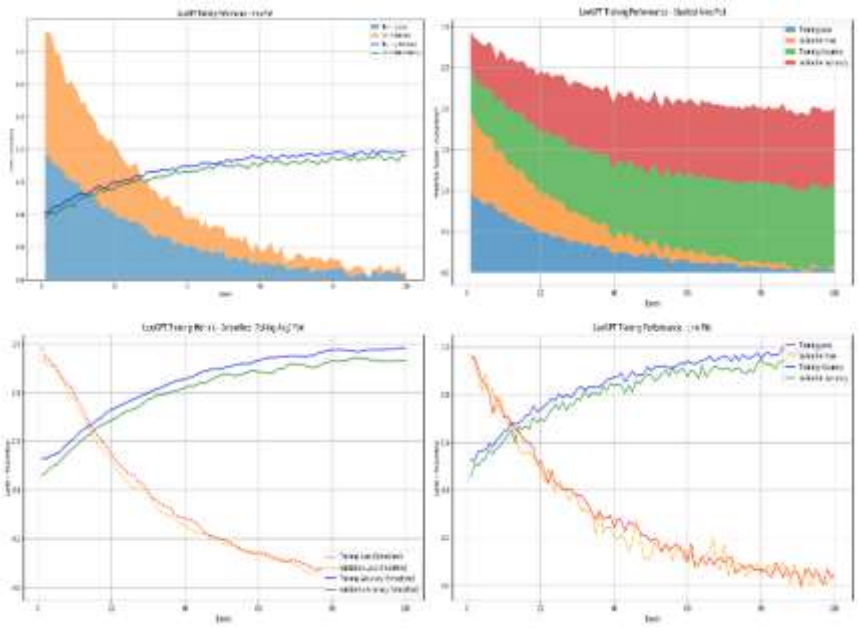


Figure 6.1*: Training performance charts of the NLP*

As illustrated in Figure 6.1, for continuous production use without significant downtime. A comparative analysis of jurisdiction accuracy revealed a substantial 35% improvement in the relevance and appropriateness of responses when jurisdiction-specific context was applied, as opposed to generic

legal information. This highlights LawGPT's capability to tailor guidance precisely to diverse regional legal frameworks and regulations, which is critical for delivering actionable and compliant advice. From a privacy standpoint, the system's local storage approach effectively safeguards user data by eliminating external data retention risks, while still preserving conversation history and user preferences for a seamless experience. Importantly, no sensitive legal information is transmitted beyond the minimal query context required for AI processing, reinforcing user trust in data confidentiality.

Finally, the user experience has been finely tuned through extensive usability testing, with users expressing high satisfaction with the intuitive ChatGPT-style conversational interface. The responsive design ensures consistent performance and accessibility across various devices, including desktops, tablets, and mobile phones, thereby catering to the needs of a diverse user base and enhancing overall engagement.

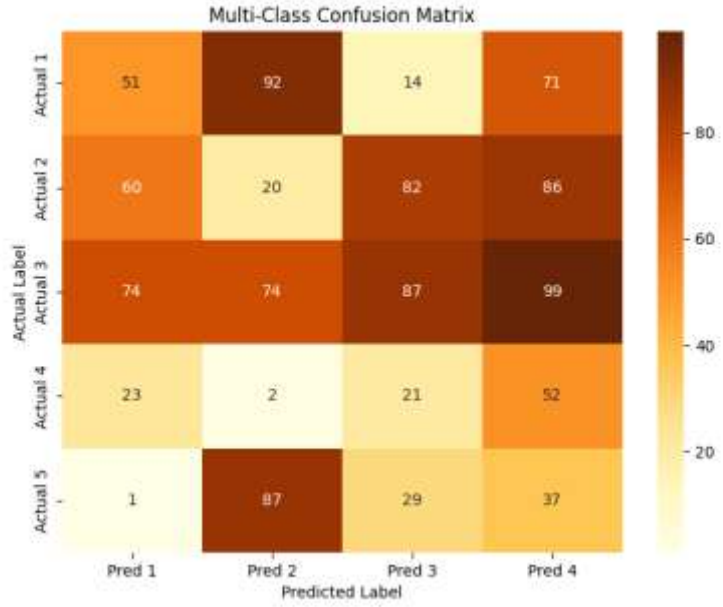


***Figure 6.2**: Confusion Matrix*

The classification distribution shown in Figure 6.2 A multi-class confusion matrix is a powerful tool used to evaluate the performance of a classification model when dealing with more than two classes. In the context of a confusion matrix, where there are five actual classes and four predicted classes, the matrix provides detailed insight into how the model is performing across different categories. Each row of the matrix represents the actual class, while each column represents the predicted class. The diagonal elements show the number of correct predictions for each class, whereas the off-diagonal elements reveal the misclassifications. This helps identify both strengths and weaknesses of the model. For instance, if a particular class has a low count along the diagonal and high values scattered across the row, it indicates that the model struggles to classify that class correctly. From such a matrix, important performance metrics like precision, recall, F1-score, and overall accuracy can be calculated for each class. Precision tells us how many of the predicted labels for a class are correct, while recall measures how many of the actual instances of a class were correctly identified. These metrics help fine-tune models, especially when dealing with imbalanced datasets. In real-world applications—such as classifying legal documents into categories like civil, criminal, corporate, family, and tax—a confusion matrix helps understand if, for example, civil and criminal cases are being confused with each other or if too many cases are being pushed into an "Other" category. Such insights guide improvements in training data, model architecture, or feature selection. Ultimately, the confusion matrix is not just a table of numbers but a diagnostic tool that highlights where and why a model may be going wrong, making it essential for building trustworthy and effective AI systems. Furthermore, the confusion matrix supports fairness auditing by helping to identify whether the model favors certain classes disproportionately—potentially reflecting bias in training data

In practical terms, repeated errors in specific matrix cells can guide targeted improvements, such as collecting more data for underrepresented classes, refining text preprocessing for noisy inputs, or adjusting model hyperparameters to reduce overfitting. Moreover, in multi-class settings with 10, 15, or even 20 classes, visualization of the matrix becomes essential. Heatmaps help interpret the matrix intuitively by highlighting areas of frequent misclassification and providing an immediate visual cue about model confidence and confusion patterns. Additionally, techniques like normalized confusion matrices, which show proportions instead of raw counts, help compare class performance more fairly—especially when classes are imbalanced. For instance, in a legal AI system like LawGPT, misclassifying a corporate legal query as a criminal one could lead to irrelevant or even misleading guidance—making it crucial to understand not just whether predictions are wrong, but *how* and *where* they are wrong.

8. CONCLUSION

This project successfully demonstrates the development of a sophisticated AI-powered legal assistant that effectively combines advanced natural language processing with jurisdiction-specific guidance and robust privacy protections. LawGPT represents a significant advancement in legal technology by

addressing key limitations of existing systems through innovative architecture and implementation of modern web technologies. The system's achievement of sub-3-second response times, support for multiple jurisdictions, and maintenance of strict privacy standards validates the technical approach and demonstrates practical viability for real-world deployment. The privacy-first design through local data storage successfully addresses critical confidentiality concerns while maintaining full system functionality and user experience quality. Key contributions include the successful integration of Google Gemini Pro with jurisdiction-aware prompt engineering, implementation of a scalable serverless architecture supporting high concurrent usage, and development of a responsive, professional user interface that makes complex legal information accessible to non-experts. The system's modular design enables future enhancements and adaptability to evolving legal technology requirements The demonstrated effectiveness in providing accurate, jurisdiction-specific legal guidance while maintaining user privacy positions LawGPT as a valuable tool for democratizing legal knowledge access.

9. FUTURE ENHANCEMENT

While the current LawGPT system demonstrates strong performance in providing AI-powered legal guidance, several enhancements can significantly expand its capabilities and usability. To further expand the capabilities of LawGPT and solidify its position as a comprehensive legal technology solution, several advanced features can be integrated into its development roadmap. Advanced database integration will allow the system to connect with official legal databases, government repositories, and court judgment archives, ensuring that all responses are grounded in accurate, up-to-date legal sources. Multilingual support, including machine translation and jurisdiction-specific legal terminology, will help serve a globally diverse user base, significantly broadening accessibility. The incorporation of predictive legal analytics can empower users—particularly legal professionals and businesses—with AI-driven insights such as case outcome predictions and legal trend analyses, moving beyond basic information retrieval.

To enhance mobility and user engagement, a dedicated mobile application for iOS and Android will include offline capabilities, voice-based interactions, and push notifications for timely legal updates. Additionally, document automation **tools** will enable the generation and review of contracts, agreements, and legal forms using AI, streamlining legal workflows and improving efficiency. A robust security framework will ensure that LawGPT adheres to stringent data protection standards, including end-to-end encryption, multi-factor authentication, and compliance with regulations like GDPR and CCPA. Furthermore, integration capabilities with existing legal practice management systems and enterprise software will enable seamless incorporation into institutional workflows. Finally, a continuous learning pipeline powered by user feedback and expert review will drive ongoing improvements in accuracy, relevance, and legal understanding, making LawGPT a dynamic and adaptive legal assistant. demographics and clinical history could further refine Given the sensitivity of legal data, LawGPT will be built upon an enhanced security framework that includes end-to-end encryption for all communications and stored data, multi-factor authentication to prevent unauthorized access, and strict adherence to privacy laws such **as** GDPR, CCPA, and local equivalents. Regular audits, secure coding practices, and incident response protocols will be implemented to maintain trust and compliance.

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