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**Research Article**

# A Comprehensive Tool for Legal Document Interpretation and Summarization using Large Language Models

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**ABSTRACT**

The proposed system in this paper introduces a user-friendly software solution leveraging cutting-edge AI technology called Large Language Models (LLMs) to simplify the understanding of legal documents and ensure fairness within the legal system. With LLMs at its core, the system offers two primary functions. Firstly, users can upload various legal documents, such as contracts or statutes, and ask questions related to their content. Using sophisticated natural language processing techniques, the system analyses these documents and provides accurate answers, aiding both legal professionals and individuals without legal expertise in navigating complex legal texts effortlessly.

By harnessing the power of LLMs, this software revolutionises how we interact with legal documents. Its advanced capabilities enable users to better understand legal papers and ensure they're fair and transparent. With its user-friendly interface and focus on leveraging LLM technology, the system aims to empower users to make informed decisions and promote fairness and accountability within the legal domain

**Keywords:**—LLMs, NLP, Legal Documents, Prompt Chaining ,Collaborative Benchmarking

## INTRODUCTION

In the proposed work, we address a prevalent issue under scored by compelling data: many individuals enter into legal agreements without a thorough comprehension of their terms. Research indicates that this trends pans across various contexts, encompassing scenarios such as businessnegotiationsandtenancyagreements.

The consequences of this lack of understanding remanifold, ranging from potential disputes to perpetuatingdisparitiesinlegalliteracy. Individuals without a legal background often find themselves disadvantaged in contractual negotiations, further exacerbatingexistingsocietalinequalities.

Our work aims to remedy this situation by leveragingsophisticated technology and linguistic strategies to simplifylegal documents. By enhancing accessibility and promotingcomprehension, we aspire to empower individuals to makeinformed decisions and advocate for their rights, therebyfosteringfairnessandequityinlegalinteractions.Ultimately, our objective is to bridge the gap between legalexpertise and everyday understanding, facilitating a moreequitabledistributionoflegalknowledgeandresources.

## LITERATUREREVIEW

Significantadvancementsandapplicationsoflargelanguagemodelsandtransformersin Health field, ,thelegalfieldinclude Comparative study of deep learning models for analysing online restaurant reviews in the era of the COVID-19 pandemic, [1],Designing intelligent Systems for Emotion Detection Of Images[2],A Deep Learning Approach for Sentiment Analysis[3],Review Prediction using Machine Learning and Neural Network[4].Rating Prediction using Machine Learning Algorithms[5], A study of tree based machine learning Machine Learning Techniques[6] in Hospitality Management.In the area of Neural Information Processing analysis on Attention is all you need [7] is discussed. Some of the work in NLP and LLMs are discussed [8],[9],[10]. Work on Generative AI and LLMs are discussed in[11].[12],[13,[14],[15.Work on IoT, BIG Data and Generative AI is focused in [16].Usage of Generative AI and LLMs in handling social impacts, psychology are discussed [17],[18] and work on clinical information extractor using Generative AI and LLMs is elaborated in [19]

IntegrationofAIinLegalPractice:UsingAIand dataanalyticstools,particularlyvirtual assistants, to optimiselegalworkflow,enhanceclientservices,legalresearch,documentautomation,predictiveanalysis,casemanagement,andclientcommunication.

### Large Language Models and the Future of Law:

Introduction of Large Language Models (LLMs), such asChatGPT, in legal contexts, exploring potential applicationsandtheirimpactonlegalactivities.

### The Impact of Artificial Intelligence on Law:

EmphasisingthenecessityoftransformingthepracticeoflawbyintegratingAI,particularlyinlegaldrafting,referencingprecedents, and constructing arguments for more efficientandaccuratelegalprocesses.

TheRoleofAITechnologyforLegalResearchandDecisionMaking:Focuseson how AI is changing legalresearchanddecision-making,emphasisingtheneedforhuman oversight to address challenges like transparency andbias.

### Legal Profession in an Age of Generative Artificial Intelligence:

SystematicallyexploringtheuseofChatGenerativePre-trainingTransformer(ChatGPT)inlegalservices,identifying challenges and suggesting guardrailsfornavigatingthem.

### The Impacts of Artificial Intelligence on Research in the Legal Profession:

Investigating how AI, particularly Legal AI, is disrupting legal research by bringing both positive and negative impacts, emphasising the positive effects outweigh the negatives and hinting at future advancements Legal Reasoning and Classification: Transformers have been employed for legal reasoning and document classification tasks. These models have shown promising results in automating legal reasoning processes and accurately classifying legal documents based on specific criteria, aiding legal professionals in managing vast amounts of legal information efficiently.

Collaborative Benchmarking:Collaborativeeffortshavebeenmadetocreatebenchmarkslike LEGALBENCHfor measuring legal reasoning in large language models. Thesebenchmarkshelpassess the capabilities of AI models inlegalreasoningtasksandenablecross-disciplinarydiscussionsbetweenlegalprofessionalsandAIresearchers.Work on Legal Consulting, Law Practices, Legal Document Review Using AI is discussed in[20],[21],[22]

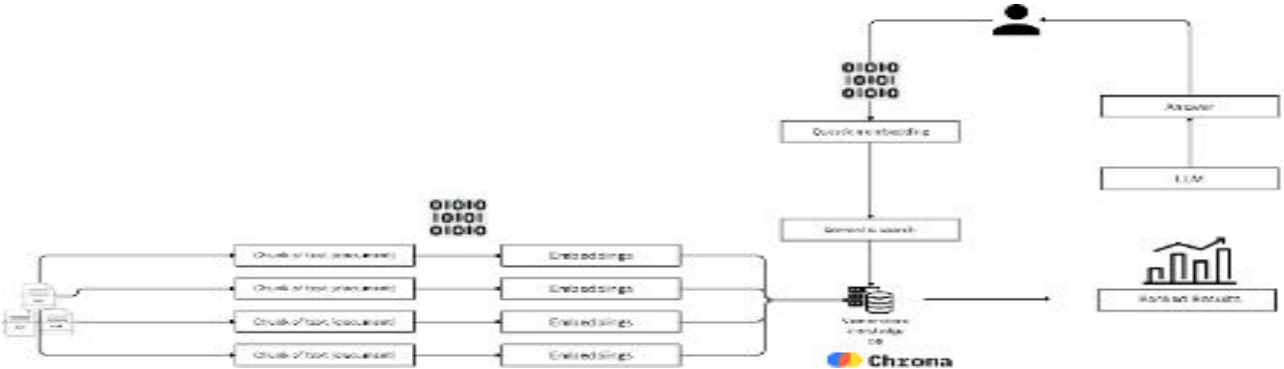
Prompt Chaining for Document Classification: Innovativestrategieslikepromptchaininghave been developed forcomplex legal document classification. By creating concisedocument summaries and utilising in-context learning fromprompts,modelshaveshownimprovedperformanceinclassifyinglonglegaldocumentsaccurately.

DocumentReviewandClassification: Transformers havebeen employed for document review and classification inlegalsettings.Thesemodelscananalyseandcategoriselegal documents, contracts, and agreements, helping lawyerstomanageandorganiselargevolumesoflegaltextefficiently.Text Classification in Legal Contract Documents is discussed in [23]

These advancements and applications showcase how largelanguage models and transformers are reshaping legal tasks,increasing efficiency, improving accuracy, and transforminglegalpracticesbyleveragingAItechnologies.

## METHODOLOGY

Our study meticulously explores the use of large language models to achieve the solution. In order to parse huge documents, we will be using a map-reduce system. The focus is on parsing huge documents and having a



question-answer based system which can solve the queries of users

*Fig1:FlowchartofLegal Document Interpretation and Summarizationsystem*

*A. ExtractingTextfromDocument*

The first and foremost thing in order to achieve. Thetext is to be extracted from the document which will be inpdf format. The extracted text will be the base for all thefurtheroperationstobedone.

*B. SplitTextintoChunks*

The major advantage of this system is the ability to parsethrough huge documents. The extracted text will be dividedintosmallerchunkswithabuffer.Weareusingamap-reducemethodtomakesurewecanparsehugeamountsoftextthroughanyLLM.

*C. EmbeddingText*

The text is converted to embeddings which is basically avector representation of that particular text. It is done inorder to store it in a vector database. There are two methodspresented in this system, one of them is using HuggingFaceEmbeddingswhichisOpenSource.

Theothermethod is using Open AI Embeddings whichisproprietary.

*D. StoringtheTextChunksasEmbeddings*

The system uses a Vector Database to store the textchunks for faster retrieval. Similarity search is carried out tofind the chunks which have the same context as the questionbeingasked.

*E. PassingthepromptLLM*

A chain is used for this to implement the conversationfeature.Therearetwo LLMs presented in this system, oneof them is using Llama which is Open Source and one moreisChatGPTAPIwhichisproprietary.

*F. MemoryPersistence*

The chat history is stored in the memory to make sure itistakenintoaccountfortheupcomingprompts.

*G. CreatingaGUI*

Designing and implementing a GUI with pdf upload andchatinputoptionssothattheusercanchatwiththedocument.

*H. IntegratingLangSmith*

Theproject is integrated with LangSmith. LangSmithtracescontainthefullinformationofall the inputs andoutputsofeachstepof the application. It helps quicklydebug,test,andcontinuouslyimprovetheapplication

## IMPLEMENTATION

*ToolsusedforComputation*

ProgrammingLanguage: The whole system was builtandachievedusingPythonlanguage.Pythonbringsanexceptionalamountofpowerandversatility to machinelearningenvironments.Thelanguage'ssimplesyntaxsimplifiesdatavalidationandstreamlinesthescraping,processing,refining,cleaning,arrangingandanalysingprocesses,therebymakingcollaborationwithotherprogrammerslessofan obstacle.

*A. TechnologiesandToolsused*

**HuggingFace**is now widely associated with state-of-the-art developments in natural language processing (NLP). They were established in 2016 with the goal of democratising AI by giving developers, academics, and companies easy access to tools and information. The Hugging Face Transformers library, which offers cutting-edge pre-trained models for a variety of NLP applications, including sentiment analysis and language translation, is the foundation of their services. HuggingFacenotonlycontributestoopen-sourceprojectsbutalsoprovides enterprise solutions for businesses wishing to usenaturallanguageprocessing(NLP)intheirgoodsandservices. Hugging Face is a dynamic community of usersand contributors that keeps pushing the limits of AI-drivenlanguageunderstanding.

**Streamlit**isatechnologyusedforbuildingwebapplications and data dashboards in Python. It is a popularopen-sourcetoolthatsimplifiestheprocessofcreatinginteractivedata-drivenapplications.WithStreamlit,developerscaneasilycreateinteractiveweb-baseddatavisualisationswithouttheneedforextensivewebdevelopmentknowledge.Streamlitallowsdeveloperstocreateresponsiveandinteractivedataapplicationswithsimple Pythonscripts.Streamlitalsooffersarangeoffeaturesthatmakeiteasytodeployandshareyourapplications.

**Llama** was released in February 2023, Meta released aset of open-source artificial intelligence models known asLLAMA, which stands for "Large Language Model MetaAI". These models are intended for use in code authoring,translation, and text production operations. In contrast tocertainrivals,LLAMAprioritisesefficiency,attainingrobust outcomes with a reduced quantity of parameters incomparisontoanalogousmodels.Originally available infour sizes (7, 13, 33, and 65 billion parameters), the 13Bversion even outperformed the OpenAI GPT-3, which wasfar larger, on a number of benchmarks. This emphasis onaccessibilityismaintainedinthemostrecentversion,LLAMA 3, which is freely available for both commercialandresearchuse.Becauseofitsopenmethodology,LLAMA is now a well-liked tool among developers andresearchersthatareworkingoncuttingedgeAI.

**Langchain i**s a framework designed to simplify buildingapplications powered by large language models (LLMs) likeOpenAI's GPT-4 or Meta's LLAMA. Launched in October2022,Langchainprovidesatoolboxfordevelopers,regardless of expertise level. Imagine Lego blocks for AIdevelopment – Langchain offers pre-built components likeprompts,dataretrievalfunctions,anddecision-makingalgorithms.Thesecanbesnappedtogethertocreatecomplexapplications.Thismodularapproachallowsdevelopers to focus on the unique functionalities of their appwithoutgettingboggeddownintheunderlyingLLMcomplexities. Langchain even offers pre-built "chains" forcommon tasks like chatbots and question answering, furtheraccelerating development. With its open-source nature andfocusonaccessibility,Langchainisfosteringa growingcommunity of developers pushing the boundaries of what'spossiblewithLLMs.

**ChromaDB**ChromaDB is not like other databases. Itis an open-source vector storage created with large languagemodels (LLMs) in mind. Chroma DB, which was introducedin2023,isdedicatedtostoringandretrievingvectorembeddings,auniquetypeofdata.Thesenumericalrepresentations of language or code, known as embeddings,helpLLMscomprehendthelinksandsignificanceofdata.

The document is uploaded by the user which is in pdfformat. The text from the document is then extracted usingPyPDF2library.

```
def get_pdf_text(legal_docs):text = ""
   for pdf in legal_docs:legal_doc_reader=PdfReader(pdf)
       for page in legal_doc_reader.pages:text += page.extract_text()
   return text
```

Thetextextractedfromthedocumentisthen split intochunksusingCharacterTextSplitterfunctionfromLangchainlibrary.Thechunksizeandoverlapissetaccordingtorequirement.

```
def get_text_chunks(raw_text):text_splitter=CharacterTextSplitter(
       chunk_size=1000,chunk_overlap=200,length_function=len
   )
   chunks= text_splitter.split_text(raw_text)return chunks
```

Thetextchunksarethenconvertedtoembeddingsandstoredtoavectordatabase,ChromaDBis used for thissystem.

```
def get_vectorstore(text_chunks):embedding_function=HuggingFaceEmbeddings()db  =
         Chroma.from_texts(text_chunks,
embedding_function)return db
```

The question from the user is then taken as input and thenpassedtotheLLMaspromptwiththecontextofthedocument.Thechathistoryisstoredinthememoryusingthe function `ConversationBufferMemory`. A chainis used for the conversation in which the LLM, retriever andmemoryispassedasparameters.Thesystemworkswithdifferent types of documentswhich are uploaded as input. Here are a few snapshots of thesystemworkingwithdifferenttypesofdocuments(leaseagreement,internshipagreement).Theusers can interactwiththedocumentandaskforqueriesregardingthedocument.This can help the users' understanding of thelegal document which will help them make better decisions

## RESULTS AND DISCUSSION

Thesystemworkswithdifferent types of documentswhich are uploaded as input. Here are a few snapshots of thesystemworkingwithdifferenttypesofdocuments(leaseagreement,internshipagreement).Theusers can interactwiththedocumentandaskforqueriesregardingthedocument.This can help the users' understanding of thelegal document which will help them make better decisions.A snapshot of the couple of questions that are put forward and the response has been reflected in Figure 2, Figure 3,Figure 4, and Figure 5.

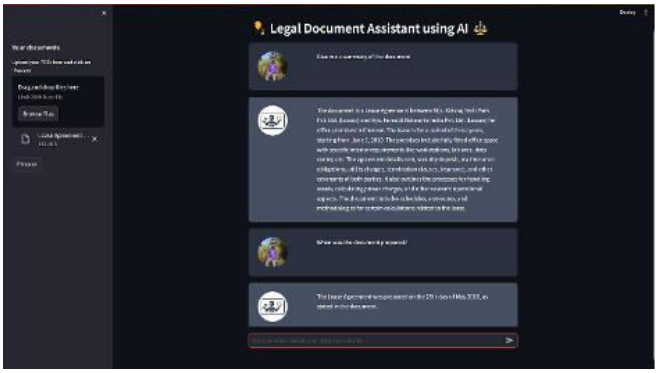



*Fig2:LeaseAgreement1*

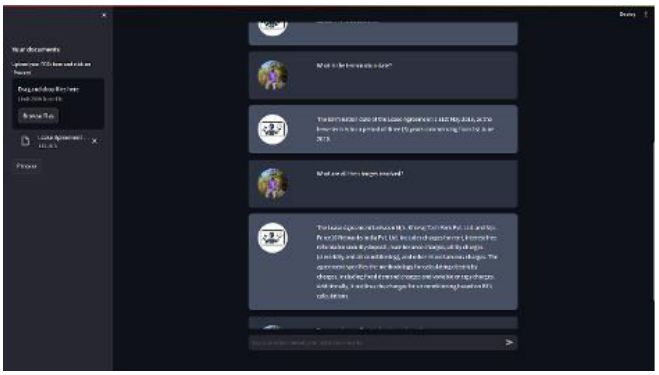


*Fig3:LeaseAgreement2*

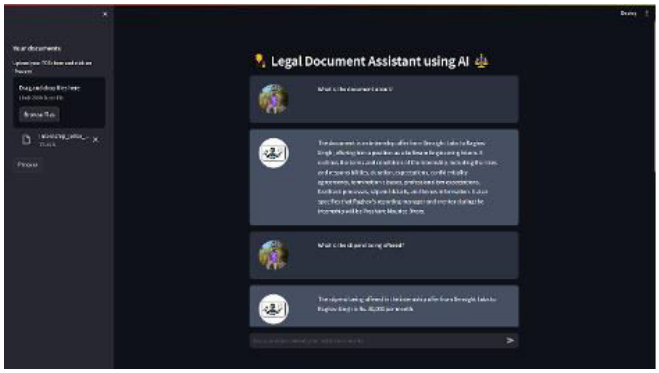



*Fig4:InternshipAgreement1*

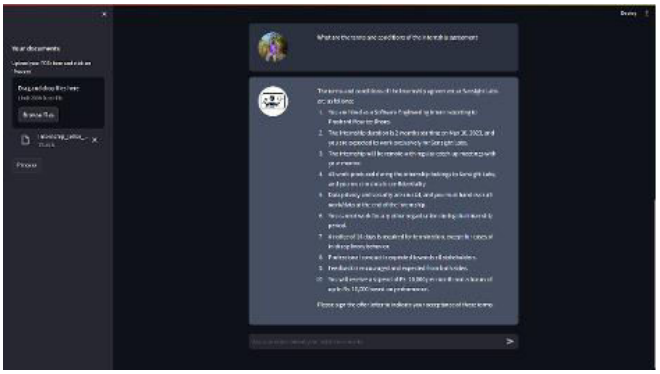


*Fig5:InternshipAgreement2*

## CONCLUSION

This work in the development of the Legal DocumentInterpretationandSummarizationserves a majorpurposeofhelpinganon-advocateperson(withnobackground of law) understand a legal document and get thequeries resolved. It is made sure that Open Source tools areused in the project so that there is no cost barrier for anyuser. Although the speed would not be the fastest, it will beenough for normal use. However, the journey doesn't endhere;thereexistavenuesforfutureworkandenhancement:

- Further refinement of the analysis algorithms canenhancetheaccuracyandefficiencyofthesystem.
- Integrationofmachinelearningtechniquescanenablethesystemtoadaptandimproveitsanalysiscapabilitiesovertime.
- Expandingthescopetoincludesupportformultiple languages and legal jurisdictions can broaden itsapplicabilityandreach.
- Continuous monitoring and updating of the systemto stay abreast of evolving legal standards and documentformatswillbeparamount.

Through these avenues of future work, the project cancontinuetoevolveandadvance,cateringtotheever-changingneedsoflegalprofessionalsandstakeholders.

## ETHICAL DECLARATION

**Conflict of interest:** No declaration required. **Financing:** No reporting required. **Peer review:** Double anonymous peer review.

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