

# An Advanced Deep Learning Based Approach for Judicial Decision Support Process

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**Abstract:** In accordance with the National Judicial Data Grid ([njdg.ecourts.gov.in](http://njdg.ecourts.gov.in)) of India, there are more than 31 million cases (out of which 23 million cases are more than an year old) pending in district and Taluka courts of India, over 4.5 million cases (out of which 2.8 million cases are more than an year old) are pending in the High Court of India. In India, especially in the rural areas, owing to limited resources as well as limited exposure to the lawyers, a case may not get strong presentation and the outcome of the case will be delayed. This is a exhaustive concern for the people, who have been spending their fortune in fighting a court case as well as fully relying on their lawyer's expertise and due diligence. This paper also provides an innovative approach called as Virtual Legal Assistant (VLA). Virtual legal assistant is a four-component based design that can assist the judges to get the legal situations with an interactive and AI based virtual assistant. The rise of advanced deep learning in the last decade broke many technological myths. Interactive virtual assistant's like Alexa or Siri are no more research topics but are now commercially available as well as widely used. The proposed approach talks about the possibility to create a similar digital assistant for judicial domain, which can be trained based on deep learning on millions of the court cases as well as it provides assistance in legal matters to the judges of various courts like civil court, session court, special court, high court, Supreme Court and tribunals, etc.

**Keywords:** Advanced deep learning, Machine Learning, Legal Intelligence, Indian Judiciary System, Virtual Assistant, NLP.

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## I. INTRODUCTION

If the previous performance is seen in Indian judiciary system over last 10 years, there is lot of advancement in Indian judiciary system in technology. India has been the witness of the fast paced digitalization of the district as well as state courts. Enhancement in the technologies as well as increasing the speed of computing power led to many innovations in this advancement of technology in Indian judiciary system. Artificial Intelligence backed systems are getting smarter, efficient and accessible day by day. This paper presents how the amalgamation of various advanced deep learning technologies can be interacted with the end-user using a dialect based conversation (chatbot) [8][9]. It is helpful to understand the crux of the situation as well as to provide guidance by searching millions of solved cases. The objective of

the virtual legal assistant VLA is to smoothen a legal case journey from inception to closure, by providing access to virtual legal assistant to assist the judges of the court.

There have been different kinds of research in the recent past on how the case similarities can be calculated using word similarities [2], predicting judicial decisions [3], as well as questioning the generation based on the context [1]. But there is no research found here where a dialogue-based bot can have a two-way interactive conversation [10] to understand the case as well as to suggest the way forward along with the resource required. Besides it, the advanced system will also suggest the effective ingredients which will be helpful to win the case. This advanced system would help the Indian judiciary system to collect the analysis of

different laws like civil procedure code, criminal procedure code, Indian penal code, special acts, etc.

Every case is unique, though there are different similarities which are found in many solved cases. The reference to the old cases will add more weight as well as it will also influence the outcome of the cases to a great extent. Therefore, the mentioned citation of the relevant cases will play a significant role in getting the cases to the conclusion. However, these citations mentioned here are very time-consuming jobs as well as it also requires a lot of thorough studies, hard work, as well as validation. The proposed VLA (virtual legal assistant) will keep narrowing the search as the user proceeds to add more details to the case and it will also rank the references in order of the winning probability. The ranking will be done using scoring algorithms like RP-score [14] as well as Mean Reciprocal Rank (MRR), which will be used to recalculate the score whenever there will be a change in the case text. This will guide legal experts to choose the most relevant case for the citation as well as it will make the case representation stronger.

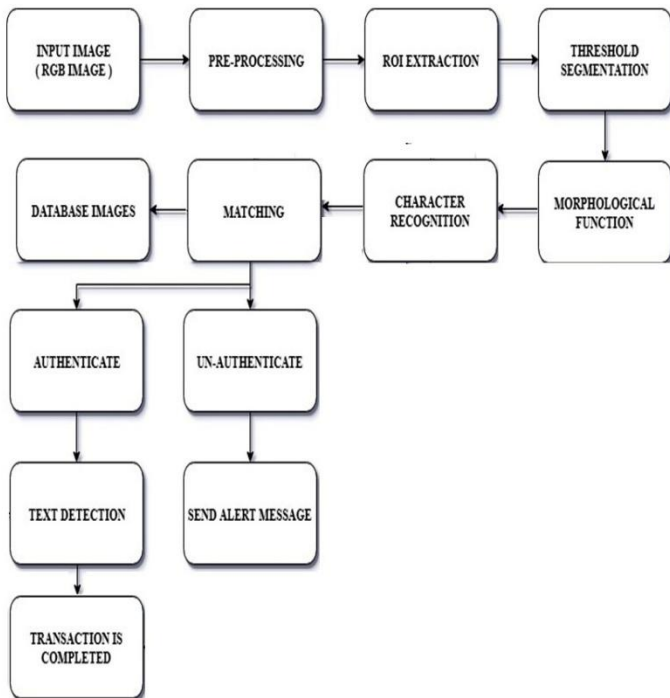


Fig: Natural Language Processing

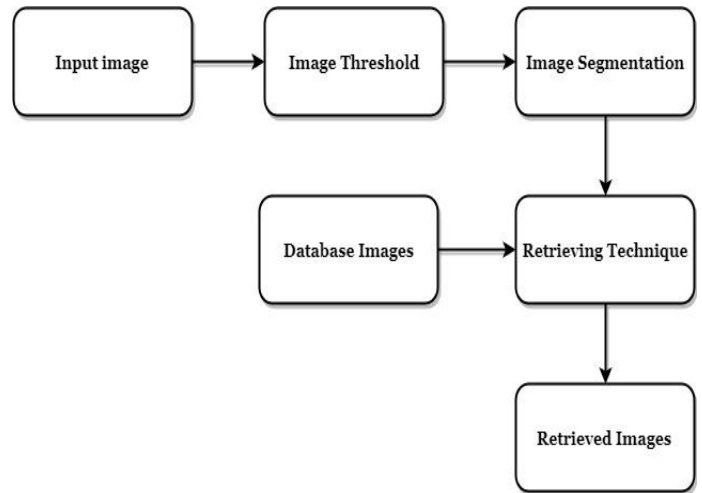


Fig: Data augmentation

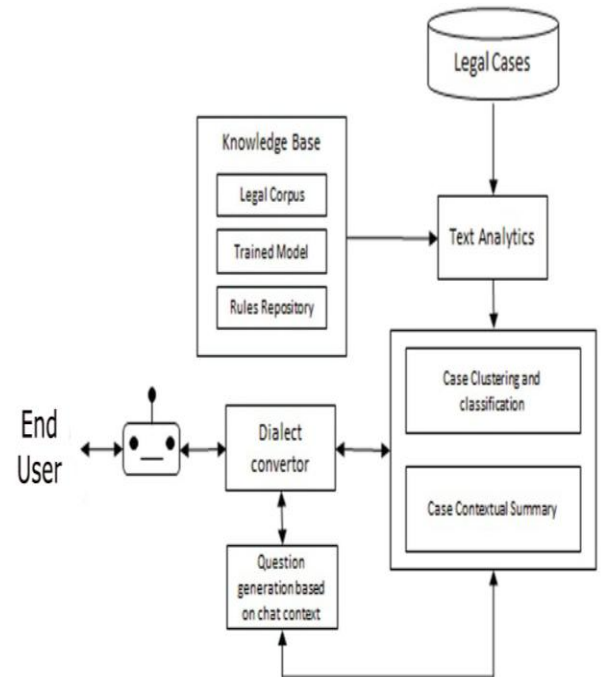


Fig: VLA component design

## II. IMPLEMENTATION IN INDIAN JUDICIARY SYSTEM

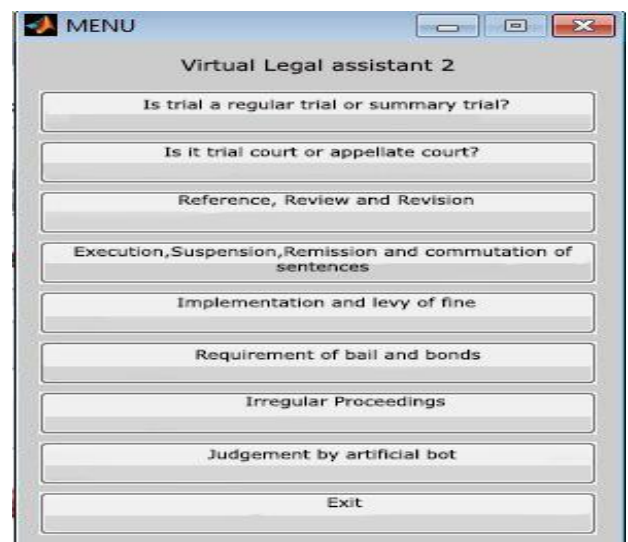
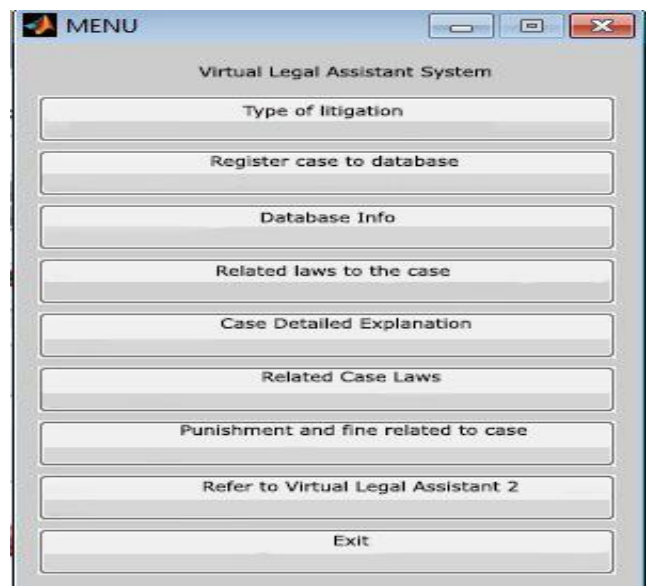
As of January 2017, there were about 1,248 laws.[4] However, since there are Central laws as well as State laws, it is difficult to ascertain their exact numbers as on a given date and the best way to find the Central Laws in India is from the official websites.

As far as the Indian Criminal law is concerned, the Indian criminal laws are divided into three major acts i.e. Indian Penal Code, 1860, Code of Criminal Procedure, 1973, and Indian Evidence Act, 1872. Indian Penal Code is a Substantive Law[4] that defines rights and duties etc. Code of Criminal Procedure defines the rules with which substantive laws can be enforced. Apart of these major acts, the special Criminal Laws were also passed by the Indian Parliament like NDPS, Prevention of Corruption Act, Food Adulteration Act, Dowry Prohibition Act, the Defence of India Act, etc. thousands of minor laws are made in India.

If we talk about the chapter 16 of indian penal code which is the offences affecting the human body in which punishment for different crimes relating to human body has been mentioned. For instance: section 299- culpable homicide, section 300- Murder, Section 301:- Culpable homicide by causing death of person other than person whose death was intended, Section 302:- Punishment for murder, Section 303:- Punishment for murder by life-convict,Section 304:- Punishment for culpable homicide not amounting to murder,Section 304A:- Causing death by negligence.If we talk about civil and commercial litigation, civil law comprises a set of rules and regulations which helps in resolving disputes which are non-criminal in nature. The law is primarily governed by the code of civil procedure,1908 which is procedural law and it pertains to the administration of civil proceedings in India.

Apropos of the virtual legal assistant for civil law of India has been concerned, the long short term memory will be trained with different civil laws in India like label for contract act, 1872, label for matrimonial laws like Hindu marriage act, 1955 , special marriage act, 1954 property law, foreign marriage act, 1969 , Hindu widow's remarriage act, 1856, etc., label for property law like transfer of property act, 1882, land acquisition (amendment) act,

1962, land acquisition(mines) act, 1885 , etc., label for family laws like family courts act, 1984, Hindu adoption and maintenance act,1956, Hindu minority and guardianship act, 1956, etc, label for company law like Indian contract act, 1872, competition act, 2002, companies act, 1956, Indian partnership act, 1932, foreign exchange management act, 1999, etc., label for intellectual property law and label for real estate law, etc.Similarly, it will be trained for acts related to criminal laws and also for special acts.



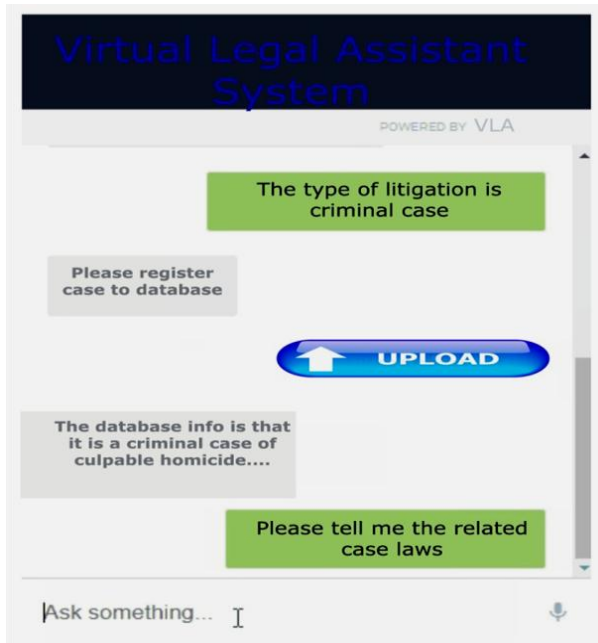


Fig: Virtual legal assistant for Indian Judiciary System

### III. RELATED WORK

As far as the related work is concerned, there are several researches here which will be used to conduct to process case data and to predict judgment based on different proposed framework.

### IV. OVERVIEW OF PROPOSED APPROACH

This section outlines our approach for the Virtual Legal Advisor (VLA) with the key components as well as their association.

There is also a Chinese legal judgement prediction.[4] where researchers would include physiological features as well as fact description of events to forecast the judgement. Some researchers would propose a similar case retrieval [5] by constructing statues as well as a case ontology. Yinglong Ma, Peng Zhang as well as Jiangang Ma [6] will

propose an ontology-driven knowledge block summarization approach which would compute document similarity for Chinese judgment document classification using KNN-based approach. A recent study [7] which is tried to strengthen various tech companies offering pre-build models, text as well as legal analytics products. The similar type of comparison has been performed on the various chatbot design techniques [11] for the Human-Computer speech interaction. The proposed approach will be designed around four key components which will be explained later in this section. These components here expected to be based on the Service-Oriented Architecture (SOA), stitched together using microservices. These microservices, would be exchanging information as well as integrating all four components e.g. whenever a new case gets added to the repository, a microservice will invoke the Text Analytics component to process the information as well as postprocessing, another microservice will also update information in the knowledge base component. Text Analytics: In text analytics, the Pre-processing [13] is the first step which is needed before performing any analytics. This preprocessing includes tokenization & cleaning, stopwords removal, stemming and part-of-speech (PoS) tagging. To calculate text similarities Word2vec, Doc2vec approaches will be evaluated. For ranking, RP-score [14] and Mean Reciprocal Rank (MRR) will be compared. The Figure 2 would represent the sample case segmentation as well as their distance ranking based on the similarities using the color code. The rank score will be calculated between the similar case segments as well as information will be stored in the Knowledge base. Whenever, a user will make or update the case which will depend on its segment, the rank score will be calculated as well as the Knowledge base will be refreshed.

- A. Knowledge Base: Here the repository for the domain corpus, rules, rank scores as well as the trained model. The Figure 3 would represent its component interaction with the Text Analytics.
- B. Question Generation Engine:  
Semantic networks as well as ontologies will be leveraged to change the contextual text to the interrogative sentences of the post content determination using the Linguistic Knowledge Builder [15]. A study represents the ontology-based intelligent Question Answering model [12], very is similar use case been studied for the online learning, where answering can be made more intelligence using semantic query function. This component will phrase the interactive question based on the user response and the case contextual summary. The figure 4 would show the flow to prepare the interrogative response which will be based on the end user response.

#### **C. Bot which is backed by Dialect convertor.**

This component is the user interface, which will transform speech-to-text as well as vice-versa. It would be backed by the engine called Question generation engine. There are various types of techniques [11] which will be specified earlier in this paper, which will be explored. The figure 5 would represent how the bot can first find the case similarity which is based on the input and then it will generate interrogative questions which will gather more insight of the situation.

#### **IV. ADVANTAGE OF THE PROPOSED APPROACH:**

This approach would directly benefit millions of people. Now most of the Indian population is a novice to the judiciary system as well as whenever any legal condition arises, they will discover themselves in the middle of the crossroad. Even if it is not expected that VLA should be replaced for legal experts. Nevertheless, it will be the first line of support, to guide the way forward. Using AI as well as analytics, the virtual legal assistant would understand the high-level situation as well as based on the solved cases, it will predict the indicative tenure, cost, as well as the winning probability. Apart from that, it can also furnish references to the judges of courts so that they can take right verdict and can give right judgement. The VLA(virtual legal assistant), people would equip the people with knowledge to initiate a discussion with the legal experts for more empirical corroboration as well as to start their legal proceedings with more accuracy and with higher confidence.

#### **V. CONCLUSION:**

The advanced deep learning is describe a lot of complicated issues in the world across the industry. The banking, retail as well as the life science is the most common playground for AI based innovations. Nevertheless, the Legal system would attract little attention as well as perhaps it gives an opportunity to explore more. In this paper, we would present how a products like virtual legal assistant can resolve any complex problem by stitching four core technical components as well as it would be an evolving paradigm in the legal advisory space.

**VI. FUTUREWORK:** In future, the related work would be dedicated to explore innovative techniques to integrate various components of

virtual legal assistant, the intelligent interaction with the end-users, as well as to evaluate algorithms as described in the earlier sections to find case similarities as well as humanly interaction with the users. All the four components which are expected to decouple, would be designed as well as be developed separately.

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