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AI and Access to Justice: An Indian Perspective

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Abstract

Artificial intelligence is set to transform the legal profession, influencing everything from legal research and document review to legal advice and decision-making. This study investigates the possible uses of AI in the legal area, such as predictive analytics and AI-powered legal research tools. This study explains the role of AI in Judicial Systems. The study covers the related literature, challenges and opportunities in Indian judicial system. The usage of AI has been widely accepted in legal processes by nations namely, the United States of America, China, France, and the European Union, whereas its adoption in India is still very limited. The employment of Artificial Intelligence in the judiciary is very low and is a challenge because of the size and complexity of the Indian judicial systems. The study continues on emphasizing the importance of a responsible and ethical approach to AI adoption in the legal realm, ensuring that AI serves the interests of justice while also upholding the integrity of the legal system. The study is about the use of artificial intelligence in the field of law, and different ML and DL approaches for predicting court verdict for various type of cases. Both the pros and cons would be analysed in the context of the Indian Judicial System.

Keywords: Judicial system, artificial intelligence, machine learning, deep learning, natural language processing

INTRODUCTION

In the recent years, AI has deeply and widely affected our society in one or another way. Integration of Artificial Intelligence with legal domain grows at a faster pace. AI tools can contribute in variety of ways in judicial system such as: (1) Data Analysis; (2) Pattern Recognition; (3) Summarization of Legal Text; and (4) Reduces Backlog of Cases. This study focuses deeper into the use of AI in law, examining both its advantages and disadvantages. The scope and impact of AI technology on the Indian legal system are also reviewed. Legal AI for decision prediction will help in fair and fast processing of court cases. Information systems using artificial intelligence will provide transparent and competent hearing of a case without undue delay by the judiciary [1].

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The study gives a brief explanation about AI tools and techniques used in different type of cases. The study is divided as follows: The following sections enlighten the related work in this field; challenges in implementation of AI in Indian judicial system; the comparative study of methods used in legal domains; the potential of AI; and finally the conclusion and future scope.

RELATED WORK

Advancements in other Countries

AI is widely used in the judicial systems of nations including the US, China, Japan, France and Europe. The application of deep learning and machine learning techniques to prediction

capabilities has enormous potential and is still growing in many different fields. One of the main benefits of ML and DL algorithms is their ability to forecast based on the recognition of specific patterns. These methods provide scalability without compromising performance as data sets increase in size and complexity. Sulea *et al.* have mentioned that a supervised learning approach was used to predict the rulings of the Supreme Court of French. The research was conducted using n-fold cross-validation to assess the results [2]. Machine Learning is widely used for classification and prediction using Labelled data set [3]. Luo *et al*. stated that the machine learning technique for forecasting court case outcomes and judge polling behaviour was first introduced in the US [4].

The neural network they developed uses the attention mechanism to identify the charge and retrieve all relevant articles in any situation. Several techniques were employed in this investigation, including SVM, the NN model Bi-GRU and SGDLP. Israeli court cases related to parental rights used a single classifier method that is Logistic Regression (LR). Single classifiers such as NV (Naïve Bayes), SVM, and RF (Random Forest) give more accurate prediction in rejection or acceptance of appeal [5]. Natural Language processing techniques are very effective for the word or sentence recognition [6]. Chalkidis *et al.* recommended the use of POS tagging and NER-based key phrase information collecting algorithms for predicting cases of in Supreme Court of India [7]. The authors proposed classification-based models partitioned into binary classification, multi-label classification and priority-based case prediction. This model also analysed the biased demographic information biasness. A "hierarchical BERT" model is use to overcome the disadvantage of BERT's length limitation.

Advancements in Indian Judicial System

India is in its inception stage to adopt Artificial Intelligence in Judicial System. A few researchers contributed in this field and the automated systems are used for language translation, case management systems, etc. Recently, a system is introduce named as Indian Legal Documents Corpus (ILDC) including 34,816 documents of Supreme Court of India. The motive behind the research is to resolve conflicts and to predict the decision in similar kind of cases to reduce the burden of judiciary and provide legal assistance to the stakeholders.

Malik *et al*. pre-processed the data set by using regular expressions and removed the noisy text along with useless information. The level of accuracy was around 78% [8]. The performance of the Naïve Bayes classifier model is very effective in predicting the verdict of petitions involving recruitment of public employees as well as those employed by local governments, government agencies, and private companies. Pandey and Agarwal used labelled dataset which included all identified features, and the supervised Learning algorithm Naïve Bayes classifier was used to predict the verdict related to status of the petition whether a petition is 'allowed' or 'dismissed'. This judgment prediction model is used on the cases filed against the Home Department of Uttar Pradesh in India. The model predicts the result with 85% accuracy, 88% recall, and 92% precision and with 90% F1 score value [9].

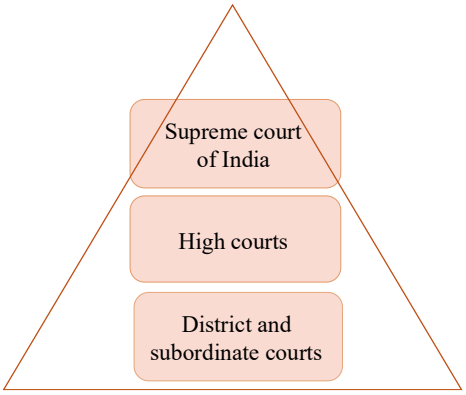

Figure 1. Hierarchal structure of Indian Judicial system.

Complex Judicial Structure of India is perhaps the most challenging paradigm to implement AI. Figure 1 shows the hierarchal structure of Indian Judicial system. The petitions filed at District level is the first step towards the justice, but unfortunately justice at each level of judiciary comes with no specific time span. As AI technologies permeate various facets of legal proceedings, ranging from case management to decision support systems, their impact on societal dynamics becomes increasingly profound. The adoption of AI in the Indian judiciary has the potential to streamline legal processes, enhance efficiency, and reduce the backlog of cases, thereby ensuring timely delivery of justice. By automating routine tasks such as legal research, document analysis, and case prediction, AI strengthens the legal professionals to focus on more complex and substantive aspects of their work. Moreover, AI (Artificial Intelligence) tools can facilitate access to justice for marginalized communities by offering cost-effective solutions and bridging language barriers.

Deep Learning with Intuitive Approach is used for explanatory research. Sagi and Rokach build a unified framework SHAP (SHaply Additive exPlanations) which provides better efficiency with human intuition. Identification of new class will provide unique solutions for the desired attributes. GBDT (Gradient Boosting Decision trees) is divided into three parts as: (1) XG Boost; (2) Cat Boost; and (3) Light GBM. They transformed the Decision tree into single and interpretative form. It provides more clarity about classification at the end user [10]. The study explored the scope of machine learning in court proceedings to predict the final verdict. The prediction can be done for the final decision along with charges and penalty in the case. Multi label text classification, binary classification, and decision forest trees are used in prediction model. Galar *et al*. focused on one to one and one to all multiclass classification; empirical analysis of the output signifies that one to one classification is more robust and binary classifications are more accurate for predictions [11].

In countries like Louisiana, judges can handle around 50 cases per day and that burden can be cut down with LJP [12]. Arditi and Pulket Proposed a modified hierarchical attention network model for legal judgement using 3-layer encoders for sentence, word and character. Two deep learning classifiers Bi-LSTM and SI-RNN were used for prediction of charge, term of punishment according to law article. The data set contained 10 types of real time criminal case of 'Madras High court' and 'Supreme Court of India'. Bhatnagar and Huchhanavar used auto ML and Decision forest algorithm for predicting delays in Indian lower courts. This research work is implemented using Google's vertex and big query for pre-processing of data. Corpus size is around 4.2 million and timeline for the cases is in between 2010 and 2020. The accuracy of the model is around 82%. They conclude that court jurisdiction, subjects, parties, and judges will affect the procedure; stay applications and inter court appeals are some factors which will restrict the accuracy [13].

Supervised Machine Learning algorithms such as SVM and KNN are very helpful for classification. He *et al.* used a 2-stage NAS algorithm on CIPHER-10 and image data set using SVM and KNN is an effective Deep Learning technique and this framework is used for auto ML [14]. Amuthan and Kaviarasan used the simple approach for summarizing Indian Court decisions using Neural Network [15]. Tribunal Courts were established for fast trial of court cases. National Company Law Tribunal is utilizing the power of AI to lower down the pendency rate [16]. To guarantee a bigger user base, Indian AI toolmakers for the legal industry must also customize their products for the needs of their intended market. Legal Kart and Indian Kanoon might offer services in national as well as regional languages like those that 'Do Not Pay' has done in the US for its citizens.

The Neural Network techniques used to interpret the Indian phrase in legal documents. Yin *et al.* designed a framework for predicting legal risk in SMEs (small and medium sized enterprises) [17]. Text mining is used for structured information. Time span and type of judgement are the parameters for prediction [18]. A novel model MHA-AR for penalty prediction focuses on key elements in modulated hierarchical attention and legal attribute sub-task. LRC (Legal Reading Comprehension) predicts the decision based on three types of information such as fact description, plaintiff's plea, and law articles [19].

Another model 'Auto Judge' recognizes the complex semantic interactions between law, fact, and plea. Divorce cases were included in the data set of Neural Text classification model with text encoder used in pair wise mutual attention and pair wise attentive reader; multiple and complex inputs could be handled by LRC. In predictive justice, supervised algorithms are used to classify a decision or set of decisions for which plaintiff has won in different case types [20].

CHALLENGES IN INDIAN JUDICIAL SYSTEM

The delays in Indian Judicial system is a challenge these days for the administration; and this is for sure questioning the accountability and credibility of legal system. These issues need to be addressed and the same could be possible with the help of innovative technology. There are many issues in the Indian Judicial System such as the backlog of cases, lack of transparent judgment, and delayed justice at the different levels.

According to the National Judicial Data Grid (NJDG), as many as 10,93,1981 civil cases and 33,284,900 criminal cases are pending all over India until July 2024. According to the Legislative Research report of PRS, the Supreme Court's case disposal rate was nearly 60% and disposal rate was only 30% in high courts and district courts which was very low [21]. The Indian Judiciary has recently begun to use AI techniques and tools like SUPACE and Indian Kanoon, which were introduced in 2022. In countries like India, there is lack of public awareness about the use of AI in the judicial system. It is very important to aware people about it and ensure fair and speedy results [22]. Figure 2 shows the pendency details of District courts in India till year 2019. Number of cases pending with their time duration depicts the pendency scenario of Indian District Courts.

COMPARATIVE STUDY OF TOOLS AND TECHNIQUES USED IN JUDICIAL SYSTEM

Mainly used learning algorithms for classification are KNN, SVM, Naive Bayes, Decision Tree and Random Forest. Table 1 summarizes the algorithms used in different types of cases along with their accuracy metrics [23–31].

POTENTIAL OF AI TO REVOLUTIONISE THE JUDICIAL SYSTEM

There are a lot of benefits and obstacles associated with integrating AI into the Indian legal system. Positively, AI has the ability to transform the effectiveness of administrative work in the court system. In recent years, number of researches have been carried out for predicting court decisions, prioritize the cases, fact and law analysis using text mining, NLP, Machine learning, Deep learning.

Garcia and Moura has mentioned in their work that financial case pendency in Brazil is around 300 cases per day [32]. According to a study of National Legal Research Group, the use of AI could minimize the time of judges in giving decision by around almost 132 to 210 h/year [33]. Figure 3 shows the majorly used AI techniques in different judicial systems.

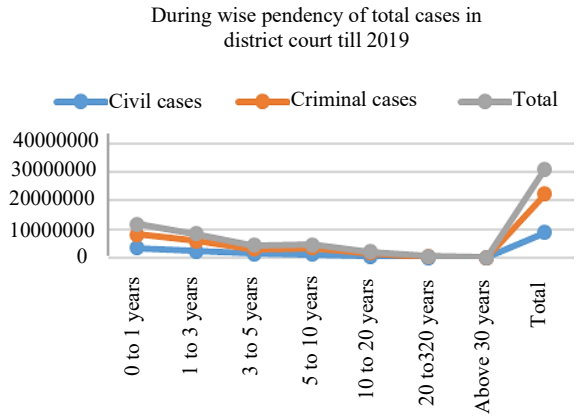

Figure 2. Pendency scenario in Indian district courts.
Source: NJDG.

Table 1. Metric based analysis.

Author	Existing Techniques in Judicial System		
	AI Technique	***Case Type***	***Accuracy (%)***
[23]	X Gradient Boost, NN, SVM, RF and TF-IDF	Criminal bail cases of Supreme Court of India	X Gradient Boost =0.76 NN Classifier =0.70 SVM classifiers =0.65 Random Forest= 0.65
[24]	Boosted Decision Tree	Construction litigation	Accuracy rate: 90
[25]	NLP, SVM	Human rights case of European court	Accuracy: 79
[26]	NB	German Tax law	Precision: 57 Recall: 57 F1 Score: 57
[27]	Ensemble Model, GBDT, KNN, NLP	Project Dispute between Government and Private Constructor	Accuracy: 96.42 Precision: 96.66 Recall: 96.38 F1 Score: 96.03
[28]	Two Layered Fuzzy Logic	Construction Contract Disputes	Accuracy: 73.9
[29]	Deep Learning Algorithm BERT, CNN	Judicial Judgment Prediction	Precision: 89.7 Recall: 89.7 F1 Score: 89.6
[30]	SVM	Charge prediction of Criminal cases	Precision: 98 Recall: 95 F1 Score: 97
[31]	SVM	Arguments based prediction	Accuracy: 93 Recall: 93 F1 Score: 92 Precision: 93

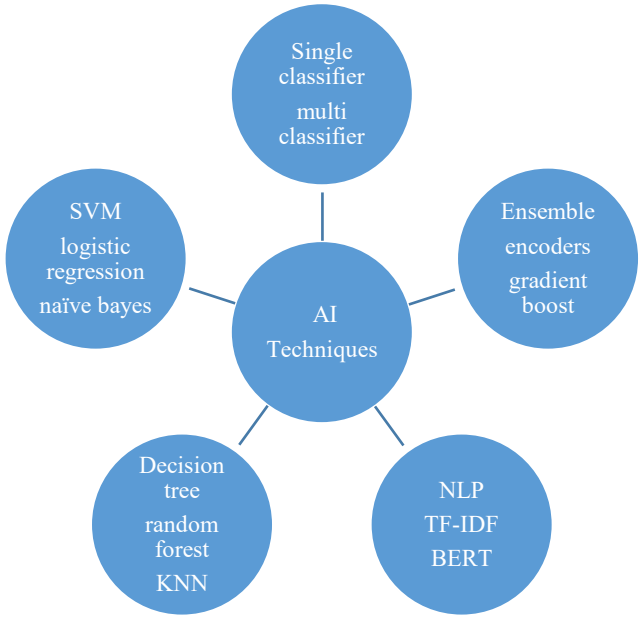

Figure 3. AI Techniques used in judicial system.

According to type of case, related algorithms can be implemented for the prediction of the case outcome. Moreover, large legal datasets can be combat through AI-powered data analysis tools, providing judges and other legal professionals with insightful information. Algorithms for

predictive analytics can help predict case outcomes, which can improve the prioritizing of cases. Resources and technologies are also required on large scale to address the issues like privacy, security and digital divide. The incorporation of AI into the legal system is more difficult in the context of ethical issues because of transferring the decision-making power to computers. AI can also improve citizens' access to justice by giving them legal knowledge and support, especially if they come from underrepresented areas.

CONCLUSION AND FUTURE SCOPE

This study tried to cover all recent research and advancements in legal system all over the world and in India. AI has the capacity to bring revolutionary changes, but implementation of the technology needs to be done carefully by taking into account all of the ethical, legal, and societal ramifications. In countries like India, justice is unreachable for the common persons and there is lack of legal aid facilities. AI definitely plays an important role in bringing change to the judicial system. The significance of forecasting court rulings can be worthy in a number of situations and may cut down the burden of judiciary. The judicial system can be improved using this strategy by being more organized and dependable. The techniques and features acquired from the research could close the current gaps in the field and help for further academic studies.

The key challenges discussed in the review work are based on certain parameters under consideration in Indian Judicial System.

- Challenges in access to justice to citizens of India due to lack of infrastructure and unawareness related to legal domain.
- Existing techniques and tools are considered and reviews are based on Case Type, Corpus Size, and Language and Statue.
- Elaborated review of recent models used in India and other countries to predict the decisions of court cases.

The study also makes a number of suggestions for more research, including more types of cases especially for complex judicial structures like India. AI promising better and fair judicial system in near future. It is expected that this systematic review study will strengthen the body of knowledge by examining court rulings, the predictive model's performance, and a discussion of different case types in the legal system. These changes do come with difficulties, though. Furthermore, the intricacy of interpreting laws presents a difficulty for AI systems, requiring human verification to guarantee correctness and legitimacy. Fair access to AI tools will bring justice to all in time.

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