LegalEx: Empowering Legal Insight for All

Aditya Pratap Singh[1], Anvi Kohli [2], Mohd Mohsin Ali[3][0009-0007-1248-8698],
Aman Saiyyad[4], Aditya Pandey[5], Aaryaman Pal[6], Manish Raj[7]
[1,2,3,4,5,6,7] Bennett University, Gr. Noida, India

[1]adityasinghpratap2733@gmail.com
[2]anvikohli13@gmail.com
[3]mohdmohsin066@gmail.com
[4]e21cseu0170@bennett.edu.in
[5]adityapandey.1622@gmail.com
[6]pal.aaryaman7@gmail.com
[7]manish.raj@bennett.edu.in

Abstract
LegalEx is an avant-garde legal technology platform which improves and then automates daily legal routines. Lawyers need to be equipped with the latest stuff in an instant, otherwise they could be left behind in the information age. It helps establish factors for success in legal disputes, for example by explaining difficult technical terms to understand or analyzing case outcomes thoroughly. Due to these factors, it increases the efficiency of a lawyer's work and makes it more direct. In most cases legal professionals are inundated with large amounts of data. The specific nature of his work is to understand and analyze text carefully. This can often be difficult and time-consuming. Legalex is a leading company in the LegalTech industry, focusing on innovation and integration. It has a strong edge in smoothing out the legal process, not just for legal professionals.

Keywords: Law, LLM's Hugging Face, BERT Score, Llama-CPP, Rogue Score, Prompt Engineering, Sentiment Analysis

1 Introduction

LegalEx is a development, in the world of law revolutionizing how legal information is accessed and enhancing efficiency. It's not a product; it caters to both the public and legal professionals serving as a bridge to close the knowledge gap that existed between them.

By simplifying complicated legal matters and providing an intuitive user interface, LegalEx makes things easier for everyone. It steps into the gaps In the current legal system, where subtle arguments or arcane phrases make it difficult to understand the essence of a case. LegalEx serves as an equalizer, providing everyone at all stages of life access to knowledge.

As a lawyer's tool, LegalEx saves time: it consolidates all court cases and past laws into a single easy-to-use platform. This way lawyers can be more efficient in what they do best.

It's worth noting that LegalEx isn't limited to the community it benefits the general public as well. It serves as a tool that transforms jargon into easily understandable information. Now anyone can confidently go through papers. Grasp the implications that may directly or indirectly impact them. This promotes engagement, with the system and fosters a feeling of empowerment.

The LegalEx platform offers benefits, to the industry as a whole. It provides lawyers with tools to enhance their efficiency by simplifying time consuming research tasks. Additionally the predictive analysis feature improves their decision making abilities. On a scale LegalEx contributes to building a society by bridging the knowledge gap and fostering citizen participation in understanding legal matters.

LegalEx is more, than a product; it represents a force that is transforming the way legal information is perceived and shared. Its impact extends beyond the community empowering individuals and contributing to an more knowledgeable legal system. By exploring its features, versatile applications and significant advantages we can truly appreciate the nature of LegalEx within the realm of law.

2 Literature Reviews

Title	Authors	Year	Publication	Approach	Results
Evaluating large language models on medical evidence summarization [10]	Tang, L., Sun, Z., Idnay, B., G. Nestor, J., Soroush, A., A. Elias, P., Xu, Z., Ding, Y., Durrett, G., F. Rousseau, J., Weng, C., Peng, Y.	2023	*npj Digit. Med*	zero-shot medical evidence summarization	Findings show that having longer text negatively impacts ChatGPT's capability to identify and extract the most pertinent information.

Large Language Models are Zero-Shot Reasoners [9]	Reid, M., Matsuo, Y., Iwasawa, Y.	2022	Neural Information Processing Systems	Addition of a specific prompt to discover zero-shot knowledge in LLMs	"Let's think step by step" followed by the remaining prompt acts as a single zero-shot prompt, expanding the ability to extract cognitive answers.
Understanding the Extent to which Content Quality Metrics Measure the Information Quality of Summaries[7]	Daniel Deutsch, D., Roth, D.	2021	Association for Computational Linguistics	Proposed a more reliable eval metric, QAEval, a unified framework of ROUGE and BERTScore	QAEval maps the alignment between the two summaries by producing all possible wh-questions in the reference summary and looks for an answer in the candidate summary and the final score is the result of the total weight alignment.
Understanding and Improving Zero-shot Multi-hop Reasoning in Generative Question Answering [8]	Jiang, Z., Araki, J., Ding, H., Neubig, G.	2021		improving models' zero-shot multi-hop reasoning capacity by SPARQL and progression of of single-hop questions	Incorporating estimations of SPARQL and concatenation of single-hop questions has drastically improved the performance score
On Faithfulness and Factuality in Abstractive Summarization [1]	Maynez, J., Narayan, S., Bohnet, B., McDonald, R.	2020	Association for Computational Linguistics	Abstractive summarization	- Tackling hallucinations is critical. - NLU driven pretraining generates factual information but it's not sufficient. - Semantic inference-based automatic measures are better representations of true summarization quality
Bertscore: evaluating text generation with bert [6]	Anonymous authors	2019		Using contextual embeddings rather than exact matches	BERTSCORE exhibits significantly higher performance compared to the other metrics.

				between candidate and reference sentences	

Table 1: Literature Review

3 Proposed Solution

Legalex will use A.I, M.L. and N.L.P. to help a Lawyer or a Law firm to do there job better. Legalex will deliver significant efficiency and low cost for professionals. Helping them to automate their day-to-day tasks like research and examine the data provided.
The most common of use of A.I. seen in law is e-discovery which is processing and examining of electronic documents obtain unauthorized information for a lawsuit. Providing information to Legalex it can provide information of cases like your case in the past and provide you with data that helped in the last case. This will be a crucial thig that will help law firms as well as lawyers.

3.1 Proposed Model:

Legal-Ex Insights, developed with artificial intelligence and deep learning, aims to solve these limitations. The platform specializes in using advanced NLP to seamlessly translate legal concepts. It is designed to facilitate context-sensitive understanding of events and policies. He also has the ability to collect and carefully analyze legal documents. Regular updates ensure it remains compliant with changes in the legal environment, while ethical and confidential procedures protect sensitive information.

3.2 Dataset

IN-Abs Dataset:
For IN-Abs, the training dataset is composed of 7,030 (document, summary) pairs, randomly sampled and stored in the "train-data" directory. The remaining 100 (document, summary) pairs constitute the test set, residing in the "test-data" directory. The structure is as follows:
Training Data:

- **train-data**
  - **judgement:** Folder containing documents for training
  - **summary:**
    - Folder containing summaries for training
  - **stats-IN-train.txt:** Text file containing word and sentence count statistics of the training documents

Test Data:

- **test-data**
    - **judgement:** Folder containing documents for testing
    - **summary:**
        - Folder containing summaries for testing
    - **stats-IN-test.txt:** Text file containing word and sentence counts of the test documents and summaries

IN-Ext Dataset:

The IN-Ext dataset comprises 50 Indian Supreme Court case documents and their extractive summaries. Each document has two summaries, provided by law experts A1 and A2. Each summary has two types: "full" and "segment-wise."

Directory Structure:

- **judgement:** Folder containing documents
- **summary:**
    - **full:**
        - **A1:** Folder with full summaries by law expert A1
        - **A2:** Folder with full summaries by law expert A2
    - **segment-wise:**
        - **A1:** Folder with segment-wise summaries by law expert A1
        - **A2:** Folder with segment-wise summaries by law expert A2
- **IN-EXT-length.txt:** Text file containing word and sentence counts of the judgements and the summaries.

3.3 Challenges:

- Ethical considerations: Legalex can raise questions on the ethical side of a law firms.
- As it runs on AI technology it lacks an amount of human judgement and sensitivity.
- Proper education and training: These are essential to ensure law firms use intellectual property responsibly and ethically. Although not all lawyers are experts in the field of AI, understanding how AI tools work is important to help lawyers full fill their responsibilities and identify ethical or privacy issues.
- Reluctance to accept new technologies: Lawyers and attorneys may be reluctant to accept new technologies such as artificial intelligence and machine learning.

3.4 Figures:

3.4.1 Architecture Diagram: The architecture diagram for Legalex project is depicted in the architecture diagram provided. Diagram is divided into 4 main parts:

- Legalex API: The Legalex API is the interface that clients use to access the Legalex platform. This API consists of many services, such as providing the functionality for generating legal documents, evaluating document quality, identifying applicable case law and automating creation and submission process with court documents.

- Hugging Face LLM: Hugging Face's Large Language Model (LLM) is an enormous language model designed to generate legal text. It's trained on a vast database of legal documents and can produce documents in all varieties of legal forms, contracts or complaints.
- Rogue Score: Rogue Score provides a way to measure the quality of a legal document. The fluency, coherence, and readability of legal documents are all assessed by the Rogue Score.
- Bert Score: The Bert Score is a utility that finds relevant case law. The Bert Score checks the whole length of a legal document against volumes of case law. If there are certain decisions which are much like your document, they will be reported in response.readlines ()

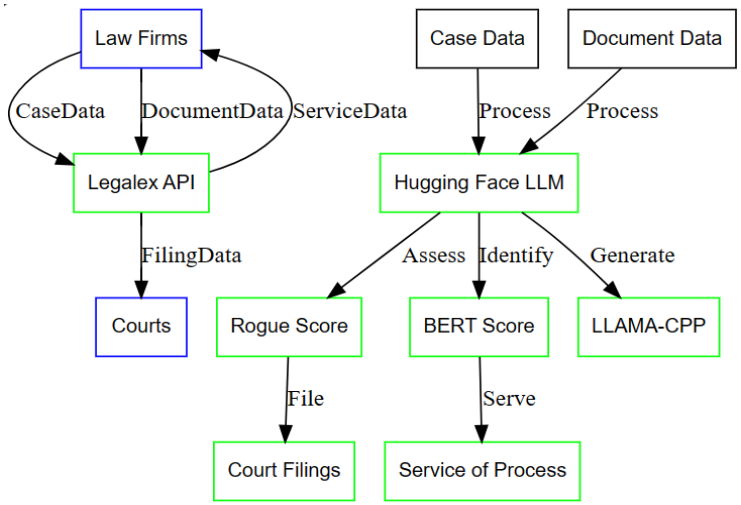

Figure 1: Architecture diagram of Legalex

3.4.2 Flowchart: The process flow of using Legalex software to create any legal documents in rising with flowcharts innovatively into modern. User Enters Case Type, Document Type, and Document Info Into the LegalX API The user starts the process and inputs layout information like case type document type and document particular , into Legalex's API whose Weasel LLM (Long legal thing compiler + bagline manager) does much of the work. The draft is then done or completed by Legalex API using the Hugging Face LLM.User Provides Case Type, Document Type, and Document Details The user supplies the Legalex API with the information it needs to fabricate a draft legal document. This information covers case variety, document type and text data.

- Legalex API Generates Draft Legal Document:Working with the LLM of Hugging Face, the Legalex API produces a draft legal document that is easy to understand layman as well as lawyer. The LLM is a giant language model

that's been trained with vast amounts of legal documents. Not only is the LLM able to use this data, it also allows its output to be both accurate and complete.

- guileful Score Assesses Quality of the Draft Legal Document:The Rogue Score is the key to assessing the quality of the draft legal document. The Rogue Score measures the ignorance, consonance and readership of legal documents. This information is then translated into input for the user to find and correct any problems that may be lurking in the draft legal document before it's filed with the court.

- Bert Score Identifies Applicable Case Law Since the Bert Score is used to identify relevant case law, it compares the text of each contract against a corpus of case law to find cases that are most similar in meaning.After receiving these results and looking up the relevant laws, the user can bring their own documents into compliance with various laws by using this information appropriately and supporting it.

- LlamaCpp Automates the Process of Drafting and Filing the Final Legal Document LlamaCpp process of drafting and filing the final legal document achieves automation through software languages.The LlamaCpp can be used to generate court forms from templates, and it can also be used to e-file these forms to the court. This in turn can save users a considerable amount of procedure.

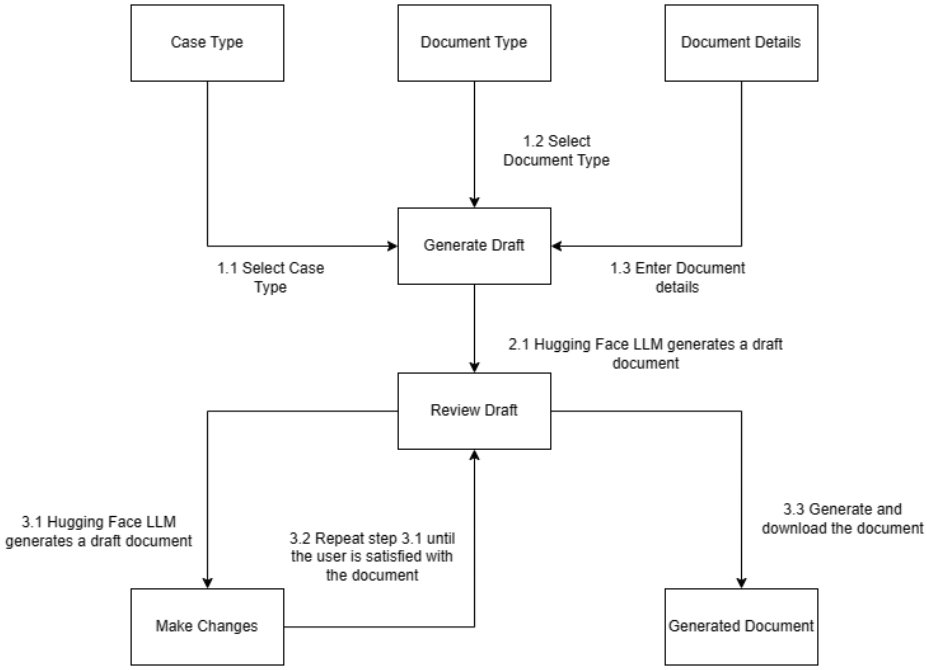

Figure 2: Flowchart of Legalex

3.4.3 Data Flow Diagram: To illustrate, this is how the Data Flow Diagram of LegalEx implemented looks like. When giving out data, follow this order of steps:

- Law firms send case data and document data to LegalEx through the LegalEx API. The LegalEx API is a web service that allows these same firms to talk with the LegalEx system. The case data and document data that is sent to LegalEx includes information such as the case type, document type, case details, and document details.
- LegalEx uses a variety of AI methods for processing the data in cases and documents and producing legal documents. Among these AI methods is:
    - Hugging Face LLM is a large language model, which is able to produce text. The Hugging Face LLM is utilized by LegalEx for legal document text generation.
    - Rogue Score is a technique indicating the quality of text. The Rogue Score is used by LegalEx to make sure that legal documents generated are of high quality.
    - A Bert Score is a tool showing relevant case law. The Bert Score is used by LegalEx to ferret out relevant case law that can go into the legal documents it generates.

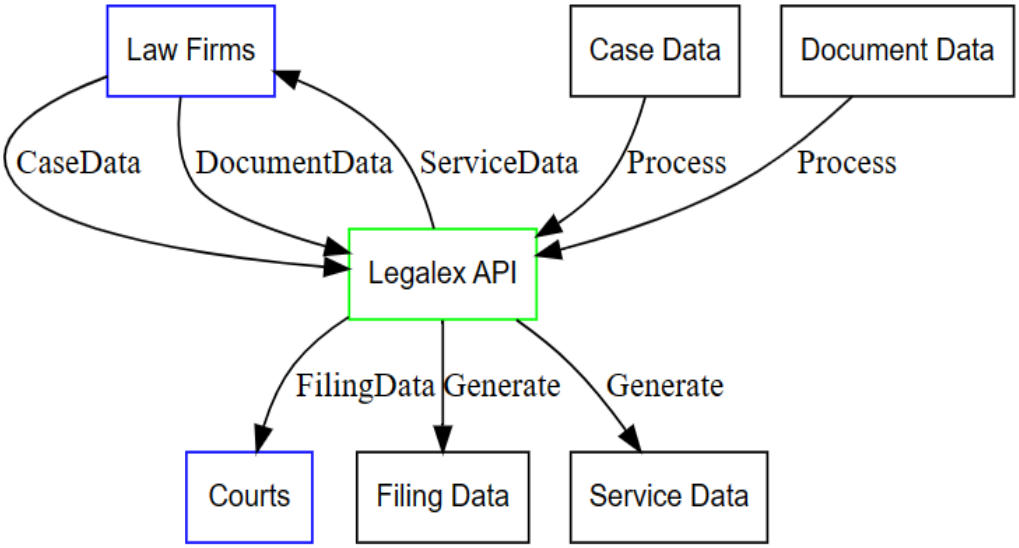

Figure 3: Data Flow Diagram of Legalex

4 Existing Solutions

1. ROSS Intelligence:
- ROSS Intelligence utilizes the power of IBM Watson. IBM Watson powers a built-in virtual legal assistant for lawyers. ROSS aims to enhance legal research efficiency by quickly extracting relevant information from vast legal databases.

2. Casetext:
- Casetext puts together conventional legal search techniques and AI driven features in order to make them more into one platform. It also uses natural-language processing technology to steer lawyers towards relevant case law with statutes. Unique among legal platforms, Casetext has a feature called CARA (Case Analysis Research Assistant) that can provide help in legal research by analyzing what you upload.

3. Ravel Law:
- Ravel Law focuses on data visualization and analytics for legal professionals. It provides tools for case law research, visualization of legal networks, and data-driven

insights. Ravel Law helps lawyers by enabling them to make more informed and advanced decisions by looking at insights and legal information presented in a visually intuitive manner.

Ways in Which LegalEx Excels:

1. **Predictive Analysis:**
    - LegalEx stands out by offering predicting of the outcome a case can result into, this provides a strategic advantage for legal professionals in decision-making.
2. **Democratizing Legal Understanding:**
    - LegalEx aims to address the knowledge gap between legal experts and the public, making legal information more understandable and more accessible helping to cater to a broader audience.
3. **Innovative Summarization Techniques:**
    - LegalEx integrates advanced summarization techniques, including the Zephyr-7b beta architecture, this help in understanding the nuances of the underlying legal text.
4. **Accessibility for the Public:**
    - LegalEx aims to let everyone have access to their legal knowledge so that they better understand their rights. LegalEx places a strong emphasis on accessibility, ensuring that legal information is conveyed in a way that is easily comprehensible for both legal professionals and the general public.

Features	**LegalEx**	**ROSS Intelligence**	**Casetext**	**Ravel Law**
User-Friendly Interface	Intuitive design for professionals & public	User-friendly, virtual legal research assistan	Natural language processing for ease of use	Data visualization and analytics
Predictive Analysis	Yes, predicts case outcomes	Not explicitly mentioned	No	No
Democratizing Legal Understanding	Bridges knowledge gap	Primarily for legal professionals	Aims to assist legal professionals	Focuses on data visualization and analytics
Comprehensive Use Cases	Legal research for professionals, accessible	Legal research with AI assistance	Legal research with AI assistance	Data visualization, legal research

	understanding for public			
Summarization Techniques	Zephyr-7b beta architecture for nuanced understanding	Not specified	CARA for case analysis	Not specified

Table 2: Comparison of LegalEx with similar products

5 Results and Discussions

So, after training the model on our dataset it was able to give output pretty neatly depending on the prompt provided to it.
For example: Prompt: - "Give me a summarization of 1953_L_1.txt with facts above 300 words, argument above 250 words, Issue above 150 words and analysis words above 400 in paragraph format use plain text"

5.1 Output

Facts:

** The textile mill had suffered a trading loss of RS 502563 in 1949.*
** Despite this, the employer paid its workers a bonus at the rate of annas 2 per rupee of their basic earnings.*
** The union representing the workers argued that the bonus should be paid at the higher rate of annas 4 per rupee, as was paid in the previous year.*
** The employer contended that it was not possible to pay such a high bonus as it had suffered a trading loss and had already paid a dividend to its shareholders.*

Arguments

** The union argued that the employer should not have distributed a dividend to its shareholders before paying the workers their due bonus.*
** The employer contended that it was not possible to pay such a high bonus as it had suffered a trading loss and had already paid a dividend to its shareholders.*

** The union also argued that the workers were entitled to a higher bonus as they had worked hard and produced more goods than in the previous year.*

Issues:

** Whether the employer should pay the workers a higher bonus than what was paid in the previous year.*
** Whether the employer should not have distributed a dividend to its shareholders before paying the workers their due bonus.*
** Whether the workers are entitled to a higher bonus as they had worked hard and produced more goods than in the previous year.*

Analysis:

The case raises important issues related to the payment of bonuses to employees, particularly when the employer has suffered a trading loss. The union representing the workers argues that the employer should not have distributed a dividend to its shareholders before paying the workers their due bonus, and that the workers are entitled to a higher bonus as they had worked hard and produced more goods than in the previous year. On the other hand, the employer contends that it is not possible to pay such a high bonus as it has suffered a trading loss and had already paid a dividend to its shareholders. The court will have to consider these arguments and make a decision based on the facts of the case and relevant legal provisions.

With following accuracy:

Bert Score

BERTScore Precision:	0.781159
BERTScore Recall:	0.807496
BERTScore F1	0.794109

Rogue Score

Rogue Precision Score:	0.1695906432
Rogue Recall Score:	0.54079254
Rogue F1 Score	0.25820

This was Scores of the model index on our one text file and when this model was used on the whole dataset it gave a Bert score of around 80% and we are taking Bert score as a primary score since it checks that the model generated text is human readable or not.

6 Conclusion

While Legalex is not foolproof, the lawyer or the law firm has to be careful, cautious, and considerate towards ethical and privacy concerns. If Legalex is used in this way, it's intended to be used it will improve efficacy of a Lawyer or a Law firm significantly. AI has the power and potential to change how Lawyers work. Legalex helps to perform daily tasks like data management and e-discovery and brainstorming. This will help Lawyer to get more done in less time deliver better experiences for their client. Any mandated background verification if required by client for the resources would be discussed and any cost arising from the same would be mutually agreed to by both partners and paid by client on actuals. Legalex in a way can help a lawyer or a law firm to have more time for more clients. Legalex will also help a great deal with research.

7 References

[1] J. Maynez, S. Narayan, B. Bohnet, and R. McDonald, "On Faithfulness and Factuality in Abstractive Summarization," in *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*, D. Jurafsky, J. Chai, N. Schluter, and J. Tetreault, Eds., Online: Association for Computational Linguistics, Jul. 2020, pp. 1906–1919. doi: 10.18653/v1/2020.acl-main.173.

[2] S. Wachter, B. Mittelstadt, and C. Russell, "Bias Preservation in Machine Learning: The Legality of Fairness Metrics Under EU Non-Discrimination Law, 123 W. Va."

[3] J. S. Gordon, "AI and law: ethical, legal, and socio-political implications," *AI and Society*, vol. 36, no. 2. Springer Science and Business Media Deutschland GmbH, pp. 403–404, Jun. 01, 2021. doi: 10.1007/s00146-021-01194-0.

[4] I. Rodgers, J. Armour, and M. Sako, "How Technology Is (or Is Not) Transforming Law Firms," *Annu. Rev. Law. Soc. Sci*, vol. 19, pp. 299–317, 2023, doi: 10.1146/annurev-lawsocsci-111522.

[5] H. Surden, "Artificial Intelligence and Law: An Overview Recommended Citation ARTIFICIAL INTELLIGENCE AND LAW: AN OVERVIEW," 2019. [Online]. Available: https://readingroom.law.gsu.edu/gsulrAvailableat:https://readingroom.law.gsu.edu/gsulr/vol35/iss4/8

[6] T. Zhang*, V. Kishore*, F. Wu*, K. Q. Weinberger, and Y. Artzi, "BERTScore: Evaluating Text Generation with BERT," in *International Conference on Learning Representations*, 2020. [Online]. Available: https://openreview.net/forum?id=SkeHuCVFDr

[7] D. Deutsch and D. Roth, "Understanding the Extent to which Content Quality Metrics Measure the Information Quality of Summaries." [Online]. Available: https://github.com/

[8] Z. Jiang, J. Araki, H. Ding, G. Neubig, and M. Zuckerberg, “Understanding and Improving Zero-shot Multi-hop Reasoning in Generative Question Answering GPT-3.”

[9] T. Kojima, S. Shane Gu, M. Reid Google Research, Y. Matsuo, and Y. Iwasawa, “Large Language Models are Zero-Shot Reasoners.”

[10] L. Tang *et al.*, “Evaluating large language models on medical evidence summarization,” *NPJ Digit Med*, vol. 6, no. 1, p. 158, 2023, doi: 10.1038/s41746-023-00896-7.